Vol. 26 AUGUST, 1905 No. 156

PUBLIC LIBRARY

THE FOUNDRY

PUBLISHED MONTHLY BY
THE PENTON PUBLISHING CO.
CLEVELAND, OHIO.

Established 1874.

"The House of Quality and Service."

The S. Obermayer Company

Cincinnati, O. Chicago, Ill. Pittsburg, Pa.

Cable Address, "Esso"

We are headquarters for

Foundry Facings and Blackings
Foundry Equipment
Foundry Supplies of all kinds
Core Room Necessities
Patternmakers' Requirements

The right goods at the right prices.
Prompt shipment and service.

Send for general catalogue
No. 40.

702 702

No. 702
Pure Ceylon Plumbago
Is a Source of Economy

702
Pure Ceylon Plumbago
Can be Used on Green or
Dry Sand Molds

702
Pure Ceylon Plumbago
Is a Perfect Core Wash

702
Pure Ceylon Plumbago
Produces a Bright, Smooth,
Clean Casting

Send for a Barrel of
702
Pure Ceylon Plumbago
If it is not satisfactory in every detail—won't cost you one cent.

The S. Obermayer Co.
Cincinnati, Chicago, Pittsburg.
"The House of Quality and Service."

702 702

J. W. Paxson Co.

FOUNDRY

FACINGS

Three facing mills

equipped with the best grinding and bolting machinery obtainable, are kept busy turning out high quality

Charcoal	**Return**	**Talc**
Anthracite	**Fire-Proof**	**Mineral**
Bituminous	**Stove Plate**	**Soapstone**

facing to meet the needs of every foundryman. We give the most value for the money. State size and kind of work you make and we'll prove it. Let us quote up-to-date prices and freight rates. Your address please.

Shipments made on same day orders received.

We will meet all competition.

PHILADELPHIA, PA.

The Paxson-Colliau Cupola

The more you examine it, the better you will like it

The Acme of Science in Cupola Construction

All that was Best in the old Colliau Cupola, with Every Improvement suggested by long experience added.

Location and area of tuyeres insure the highest melting efficiency

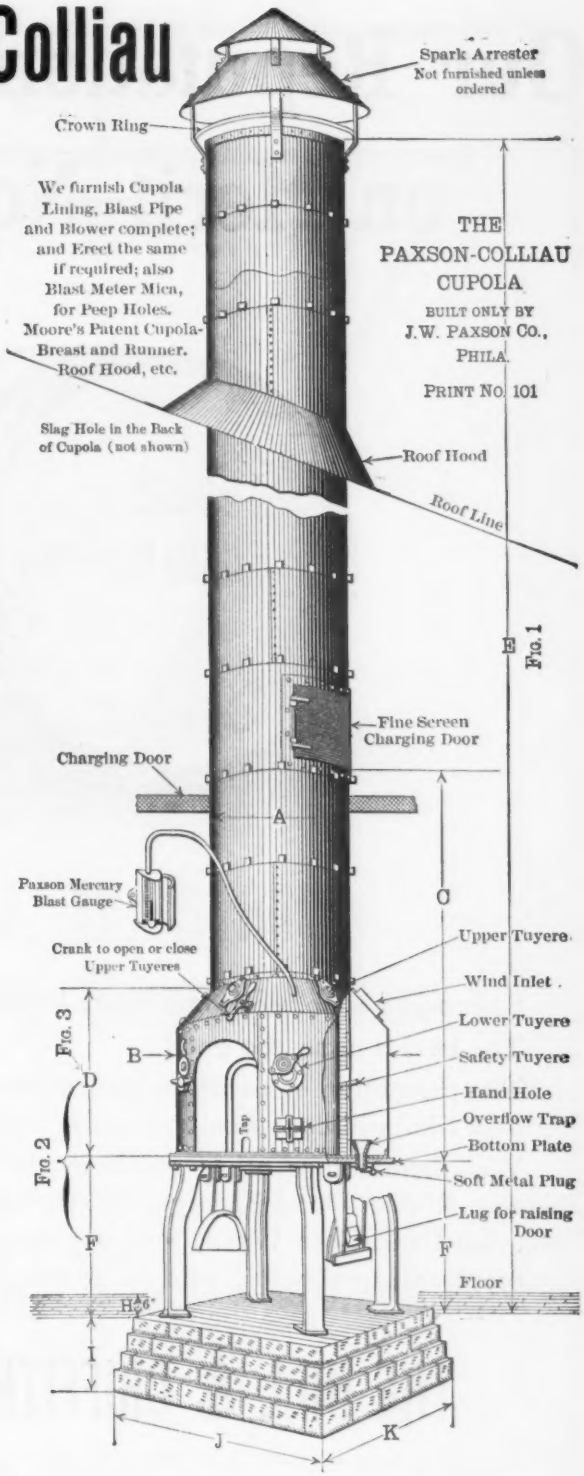
It keeps us hustling to fill the orders for these goods

MADE ONLY BY THE

J. W. PAXSON CO.

1021 North Delaware Avenue

PHILADELPHIA, PA., U. S. A.



Our Reputation Founded on Merit=Not Age.

Cheapness is not economy when it comes to buying Plumbago.

The best is none too good.

The reputation of our Pure East India Plumbago is built upon true merit—a trial will convince you of the truth of our statement.

We manufacture other goods in the foundry line—Stove Plate Facings, Rhode Island Facings, Heavy Machine Facings, Soapstone, Talc, Sea Coal, Core Wash, Foundry Supplies and Equipment—all of an exceptional quality and sold on an unconditional guarantee.

THE HILL & GRIFFITH COMPANY

WRITE US.
Our catalog No. 5 for the asking

CINCINNATI, OHIO

Velvet Blacking

Gives a velvet finish to Dry Sand and Loam Castings. "Smooth as Velvet" for large and small cores. Sample kegs free.

Price $25.00 per ton.

The J. D. Smith Foundry Supply Co.

CLEVELAND, O.

OFFICE AND WAREHOUSE

36, 38, 40 South Water St., Cleveland.

WORKS

Cleveland Facing Mill

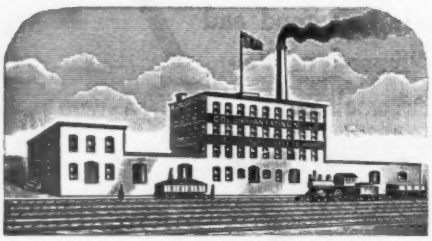
Cleveland.

Have a Catalogue?

Watch for ads of Black Silk Plumbago and Satin Soapstone.

Buffalo Foundry Supply Co.

BUFFALO, NEW YORK



Sole manufacturers of

Columbia Dry Sand and Loam Facing

Also manufacture many other kinds, such as

COLUMBIA CAR WHEEL FACING

COLUMBIA HEAVY STOVE PLATE FACING

COLUMBIA CORE WASH **COLUMBIA RETURN FACING**

COLUMBIA FIRE-PROOF FACING **COLUMBIA INGOT MOLD FACING**

As well as many others of our SPECIAL FACINGS, and of course we have

SEACOAL FACING

COLUMBIA CORE COMPOUND

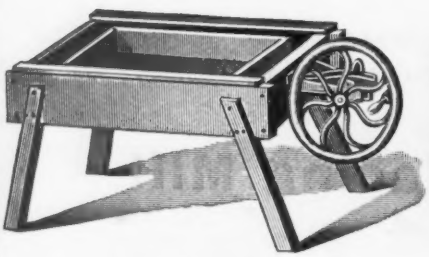
FOUNDRY SUPPLIES

of all kinds

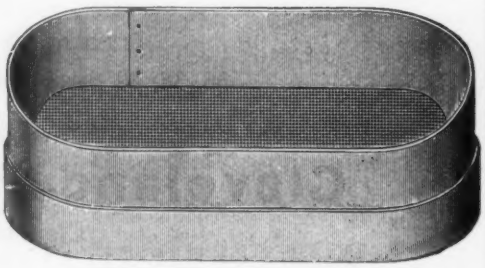
ALBANY MOLDING SAND

of all grades—

0-1-1½-2-2½-3-3½-4



Portable Foundry Sifting Machine



The Kingsland Oval Snap Flask Riddle

WHEN WRITING KINDLY MENTION "THE FOUNDRY"

No. 145

Ceylon Plumbago

has

5 Good Points

Unadulterated

Uniformity

Richness

Fineness

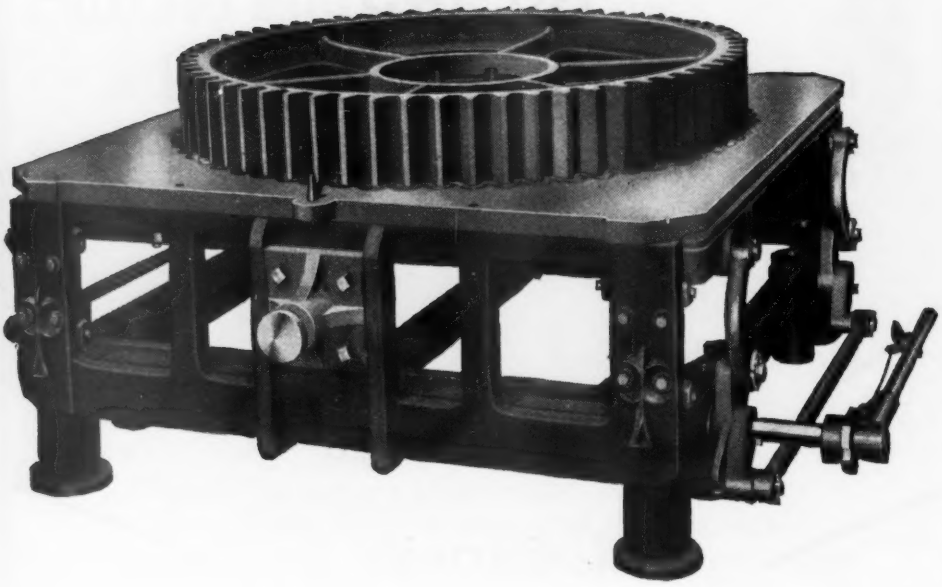
No Waste

Send for free sample.

FOUNDRY SUPPLY DEPOT

J. S. McCormick Co.

PITTSBURG, PA.



The above cut shows a

PRIDMORE MOLDING MACHINE

of the heavy, double shaft, turn-over type, fitted with a wooden pattern and iron stripping plate for molding gears 47″ dia., 6″ face.

One molder and a helper, who formerly put up and poured 3 flasks for a day's work, are now getting 7 flasks from the machine. The pattern is the identical one used on the floor, yet there is now a saving of 90 lbs. of iron to each casting.

HENRY E. PRIDMORE

CHICAGO, ILL.

MOLDING MACHINES

SEND FOR CATALOGUE NO. 9

Over 7000 of our machines in use.

The Adams Company

Dubuque, Iowa, U. S. A.

J. W. Jackman & Co., London, S. W., England
H. Glaenzer & Perreaud, Paris, France
V. Lowener, Copenhagen, Denmark
Ing. G. Pontremoli & Co., Milan, Italy

Power Ramming Split Pattern Machines

Power Ramming Stripping Plate Machines

Power Ramming Vibrator Frame Machines

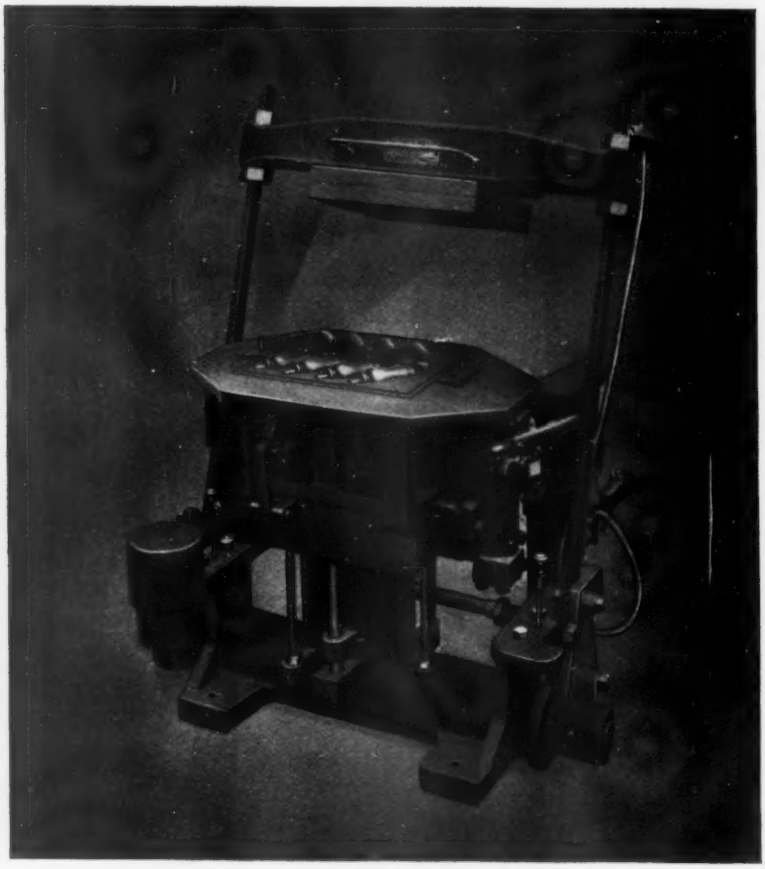
Power Ramming "Squeezers"

Hand Ramming Split Pattern Machines

Hand Ramming Stripping Plate Machines

Hand Ramming Vibrator Frame Machines

TABOR



MACHINES

The Tabor Manufacturing Company

18th and Hamilton Streets, Philadelphia, Pa.

Chicago Office
28 So. Canal Street

Fenwick Freres
Paris

49, Deansgate
Manchester, England

Molding Machines

WILL REDUCE

COST of MOLDING

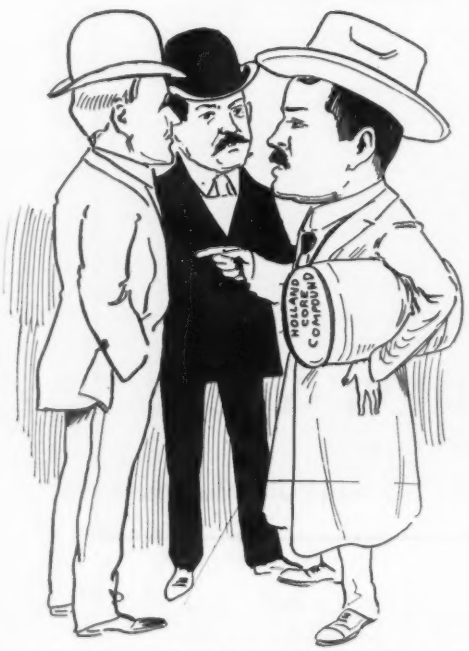
TO INVESTIGATE IS TO
BE CONVINCED

Taylor, Wilson & Co.,
(LIMITED)
101 Grant Avenue, ALLEGHENY, PA.

Having trouble with your Cores ?

NO, WE USE

HOLLAND LIQUID CORE COMPOUND



CLINCHING THE ARGUMENT IN THE DISCUSSION ABOUT VENTLESS CORES.

It is the Best by Test.

Is the Cheapest.

Makes Ventless Cores.

Never spoils work whether complicated or simple.

Holland Linseed Oil Company,

685 Austin Avenue, CHICAGO, ILL.

See pages 209 and 49 of July Foundry.

THE OREGON FOUNDRY and MACHINE COMPANY

Oregon, Ill.

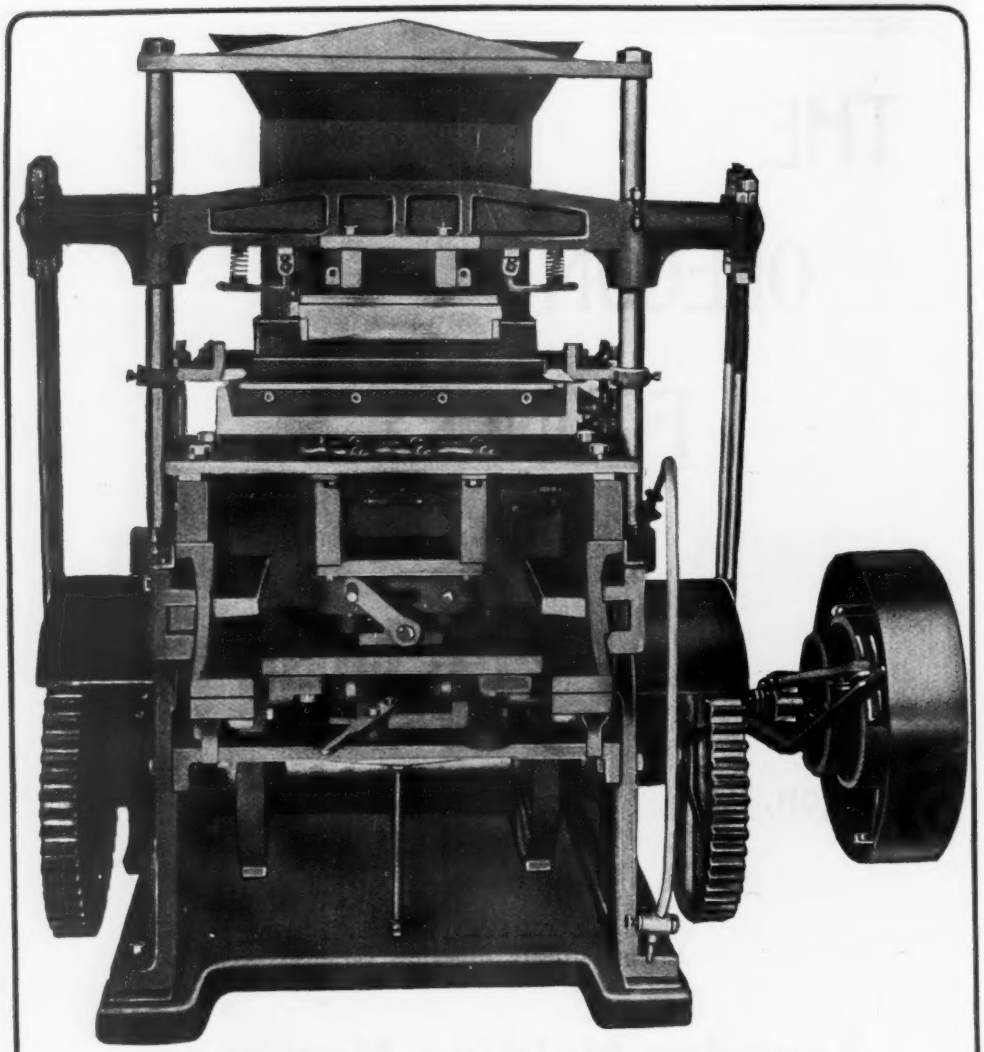
Manufacturers of High Grade

Foundry-Molding-Machinery

Made to meet any and all requirements

Large or Small—Round or Square

We Solicit Your Patronage



The Molding Machine that does all the work
quickly—accurately—continuously

The Berkshire Molding Machine

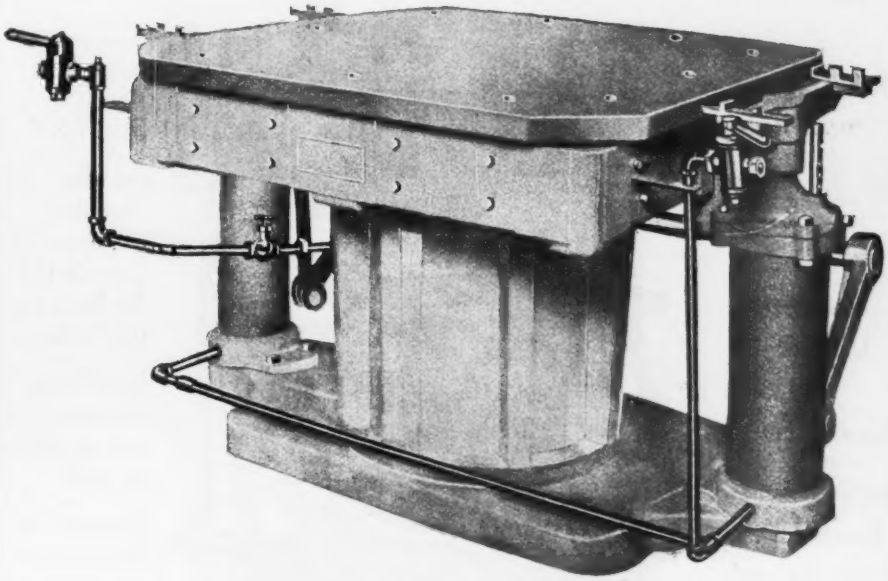
Simple in construction, positive in its movements, all working parts protected from dust, will stand the roughest usage, can be operated by anyone. All the operator has to do is to place flask and board in position, throw lever and in 5 seconds remove the finished flask.

The capacity of machine is from five to ten times greater than any other Molding Machine on the market. We fully guarantee this machine to do all we claim for it.

THE BERKSHIRE MFG. CO.
Cleveland, Ohio

Herman Pneumatic Jarring Molding Machine

for iron and steel castings



No. 11 machine for flasks 50″ x 50″—20″ draw.

The Man fills the Flask with Sand—
The Machine does the rest.
The only Machine that has the proper Combination
It completely rams the largest Molds
also draws the patterns.
No Hand ramming.

Write for descriptive matter.

Chas. Herman & Son,

Sharpsburg, Pa.

The Pneumatic Engineering Appliance Co., Ltd, Palace Chambers Westminster, London, England, Foreign Representatives.

Molding Machines

Vibrator or Stripping Plate

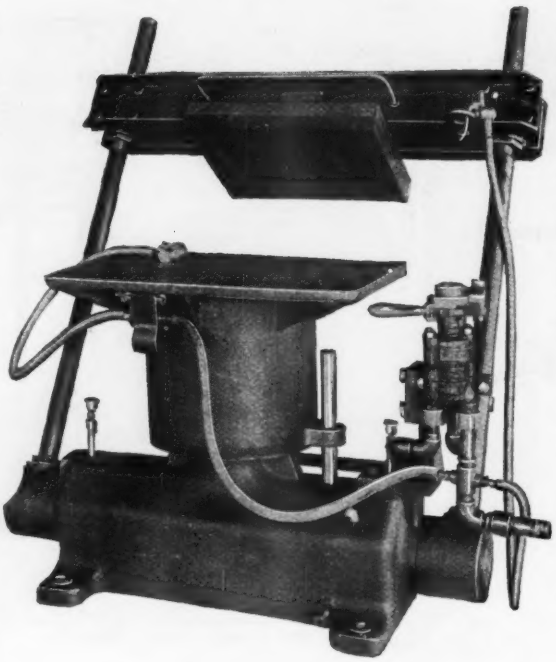
This one is simple but has

GOOD

Light, Stiff, Strong Tubular Strain Rods.

Can Ram Molds to Gauge Pressures thus Ensuring Uniformity of Suitable Ramming Force.

Counterbalance of Ramming Yoke Entirely Enclosed in Base of Machine.



POINTS

Trunnions of Strain Rods Absolutely Sand Proof.

Our Non-Leaking Throttle is the same that Controls the Air Brakes on the Trolleys.

Limit Stops of ramming yoke well up out of sand.

Simplicity of Design leaves no cumbersome Valves, etc. to catch sand.

Plain Power Squeezing Machine 36" between Strain Rods; for Loose; Gated and Plated Patterns.

NOTE THE VIBRATOR.

The E. H. Mumford Co.

17th & Callowhill Sts.

Philadelphia, Pa.

ROOTS BLOWERS.

Yes.

Yes, that was a good record.

Yes, there is only one Roots' Blower.

Certainly, will be glad to.

P. H. & F. M. ROOTS CO.

Home Office

CONNERSVILLE, INDIANA.

CHICAGO OFFICE
1547 Marquette Bldg.

NEW YORK OFFICE
120-122 Liberty St.

ROOTS BLOWERS.

Is this Roots, at Connersville?

I am very much interested in W. J. Keep's paper read at the New York meeting of the National Foundrymen's Association, describing his melting plant at the Michigan Stove Co.

Was the Roots Blower referred to built by you?

I wish you would send me catalogue and prices.

P. H. & F. M. ROOTS CO.

Home Office

CONNERSVILLE, INDIANA.

CHICAGO OFFICE
1547 Marquette Bldg.

NEW YORK OFFICE
120-122 Liberty St.

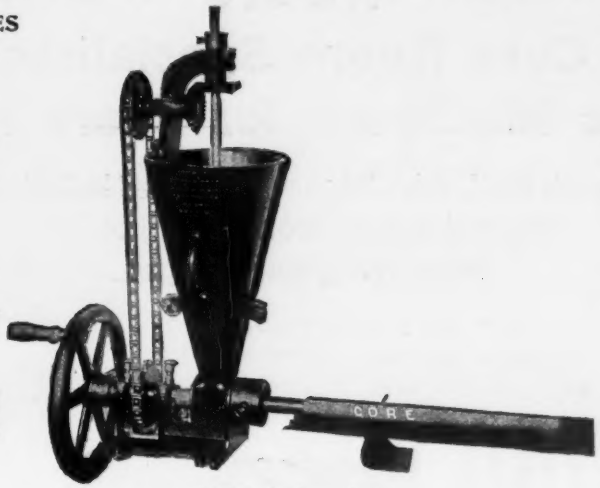
HAMMER CORE MACHINE

NO CORE BOXES REQUIRED

NO RAMMING OF SAND BY HAND

NO UNEVEN VENT HOLES

NO TRIMMING OR FILING OF CORES



Machine in Operation

LESS OVEN SPACE NEEDED

LESS FUEL REQUIRED

LESS BREAKAGE

LESS COMPLAINT FROM YOUR CUSTOMER

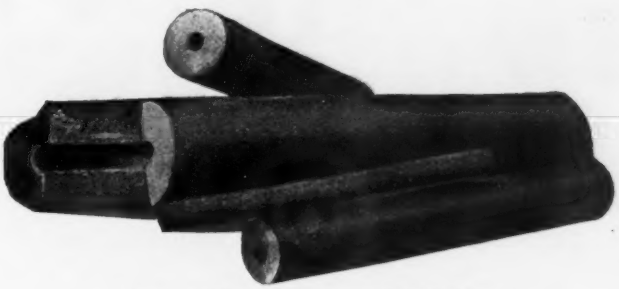
Nearly 1,000 of these machines now in use. Over 40 in Chicago alone.

This is the original Core Machine and superior to all others.

Because:—

It does all we claim for it.
It has the only perfect feed device.
It has stronger and more serviceable conveyors.
It can be run at lower speed, therefore wears longer than any other machine.

Our Machine makes perfectly round cores 3-8 to 2 1-4-in. in diameter.



Our Standard Machine is equipped to make 16 sizes of cores 3-8 to 2 1-4-in. in diameter by eighths.

Cores made on the Hammer Core Machine

Send for descriptive catalogue and price list

Brown Specialty Machinery Co.

N. W. CORNER JACKSON AND CLINTON STREETS

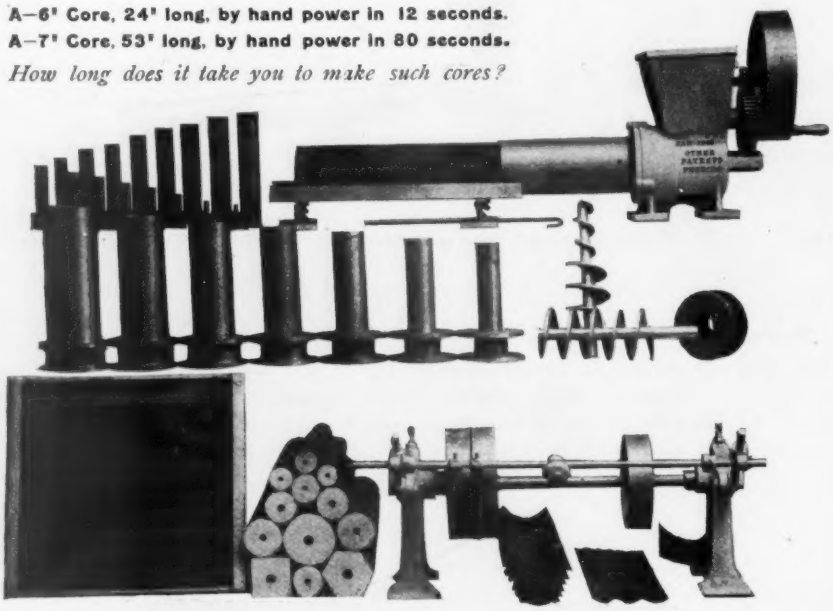
CHICAGO

Berger-Carter Co., 150 Beale St., San Francisco, Calif., exclusive agents for Pacific Coast.
Thos. W. Pangborn Co., 42 Dey St., New York City, N. Y., exclusive agents for New England, New York and New Jersey.

We are
Core Room Specialists
Core Machines for every need

Hand, Belt, Air, Steam or Electric Driven.
Round cores from 3/8" to 7"
Also irregular shapes.

A—6" Core, 24" long, by hand power in 12 seconds.
A—7" Core, 53" long, by hand power in 80 seconds.
How long does it take you to make such cores?



The wide range of shapes, the great strength and accuracy of cores made on our machines make them the best possible investment for your foundry.

Write for prices and descriptive catalogue.

The Falls Rivet & Machine Co.

Cuyahoga Falls, Ohio, U. S. A.

FOREIGN AGENTS:
J. W. Jackman, London, England. **Franz Kustner, Dresden, Germany.**
Hamilton Sand & Facing Co., Hamilton, Ont.

Try then buy.

As necessary in a foundry as a cupola.

Clark's Metallic Filler

Enables you to get every possible cent of profit out of your foundry.

The only cement you can rely on—fixes all blow holes, cracks and uneven surfaces—blends faultlessly in color, never turns white, rusts with the casting and *never* gets loose. You cannot afford to throw away castings when a small outlay and a little time will make them all O. K.

Send for free sample today.

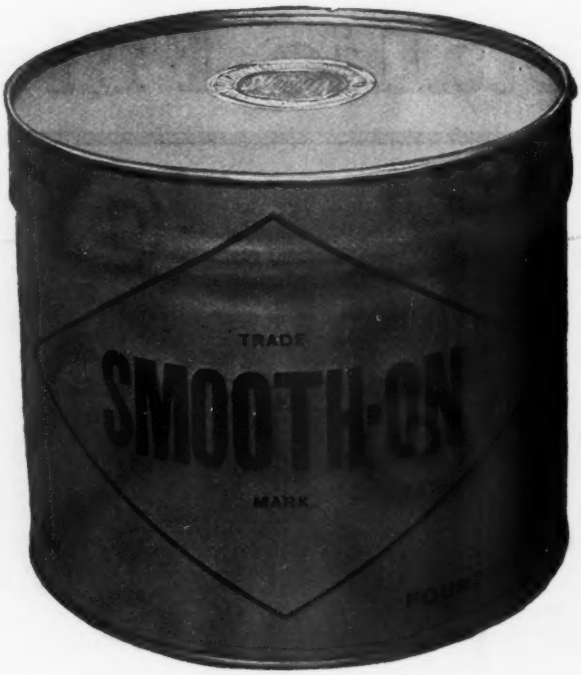
D. N. Clark

Drawer 11

Shelton Conn.

Use The Best

SMOOTH-ON CASTINGS, for repairing blemishes or blow holes in iron or steel castings. When hard, this cement has the same color and appearance as cast iron, and will withstand a red heat, steam, water or oil.



Our new 100-page illustrated catalogue and prices will interest you

SMOOTH-ON MFG. CO.

572-574 Communipaw Ave.

JERSEY CITY, N. J., U. S. A.

CHICACO OFFICE
61-69 N. Jefferson St.

SAN FRANCISCO OFFICE
61 Steuart St.

AGENTS FOR GREAT BRITAIN
Hodgson Hartley, Ltd., Little Peter St., Knott Mill, Manchester, England

CAST STEEL CEMENT

Don't use a filler—Use the genuine article.

Fills blow-holes, cracks and other imperfections in iron or steel castings. Same color and hardness as casting itself. Stays there forever and becomes part of the casting. Makes steam, water, gas, and air tight joints. Send for free sample.

THE CLARK CAST STEEL CEMENT CO.,
SHELTON, CONN.

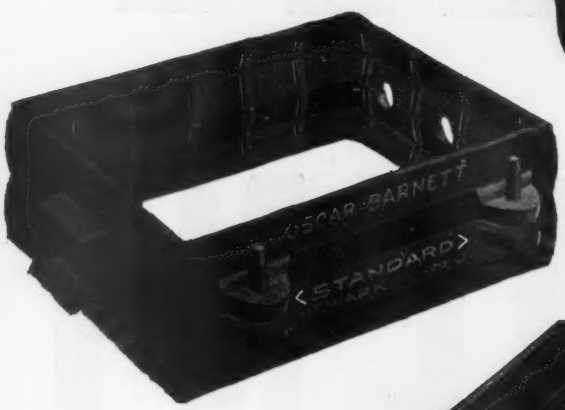
AGENTS

J. W. Jackman & Co., 39 Victoria St., London, Eng.
Benjamin G. Elliott, 33 Tehama St., San Francisco, Calif.
J. Howard Jones & Son, 305 Dearborn St., Chicago, Ills.

BRASS MOLDERS' FLASKS

OF EVERY STYLE AND SIZE

Furnaces, Drying Stoves, Spill Troughs, Clamps, Boards, Tongs, Crucibles, etc., etc.



All our flasks interchange with any of same size made by us.

Our own foundries ensure prompt shipments

THE OSCAR BARNETT <STANDARD> FLASK

IS MADE ONLY BY

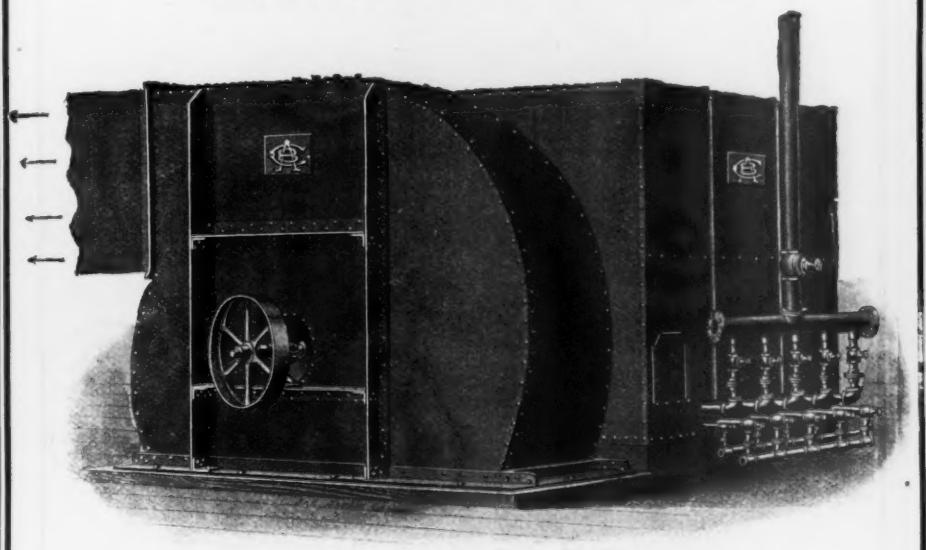
Oscar Barnett Foundry Co.

Founded 1845

NEWARK, N. J., U.S.A.

ECONOMY AND EFFICIENCY

commend the "ABC" Fan System for the heating and ventilation of foundries.



The Michigan Malleable Iron Co. of Detroit, Mich., in replying to an inquiry regarding their "ABC" Heating System say:

"The system installed by the American Blower Co. of this city, is entirely satisfactory. We utilize it as much in summer as in winter, and can state that it is the most economical as well as the most satisfactory manner of heating and ventilating that we are aware of."

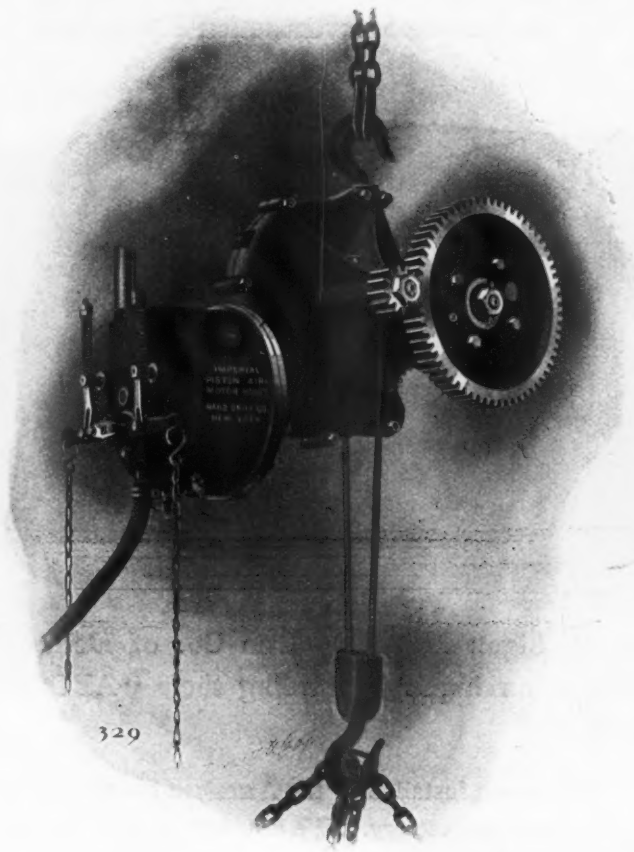
It is none too early to get into good shape for next winter.

American Blower Co., Detroit, Mich.

Manufacturers Fans and Blowers for all purposes.

NEW YORK CHICAGO ATLANTA LONDON

ROCK DRILLS AIR & GAS COMPRESSORS. PNEUMATIC TOOLS



IMPERIAL HOISTS FOR FOUNDRIES

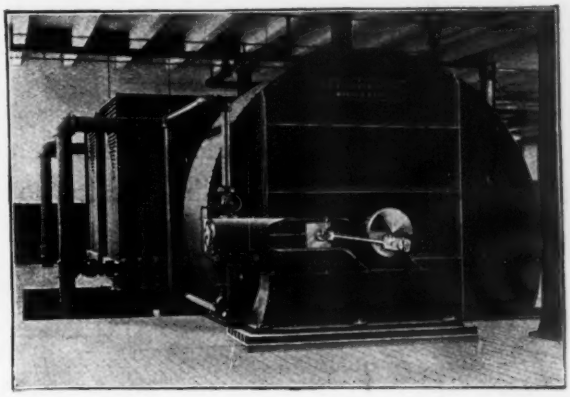
Size No.	Capacity in Lbs.	Lift per min. 80 lbs. Pressure	Maximum Lift.	Size and Length Wire Rope.	Free Air per min.	Net Weight.	Shortest Distance between Hooks.
1	1,000	30 ft.	17 ft.	3/8" x 37 ft.	30 cu. ft.	250 lbs	28 1/4"
2	2,000	15 "	17 "	3/8" x 37 "	35 "	275 "	8 1/4"
4	4,000	8 "	17 "	3/8" x 37 "	40 "	300 "	31 1/4"
7	7,000	8 "	12 1/2 "	3/8" x 60 "	45 "	640 "	41 1/4"
10	10,000	7 "	12 1/2 "	3/8" x 60 "	50 "	660 "	41 1/4"

COMPLETE AIR PLANTS INSTALLED

BOSTON, BUTTE, CHICAGO, DENVER, DULUTH. RAND DRILL CO. NEW YORK. PHILADELPHIA, PITTSBURG, ST. LOUIS, SALT LAKE CITY, SAN FRANCISCO.

Planning and Installing a Satisfactory Blower Heating System

isn't a thing to be done in a day. If you need to equip your plant for next winter you ought to consider it now. Frankly, we want to figure on it, and we want to give it the consideration it deserves.



The Sturtevant System ventilates as well as heats, eliminates all scattered steam piping, utilizes exhaust steam, forces the air just where it is wanted and is under perfect control.

B. F. STURTEVANT CO., Boston, Mass.

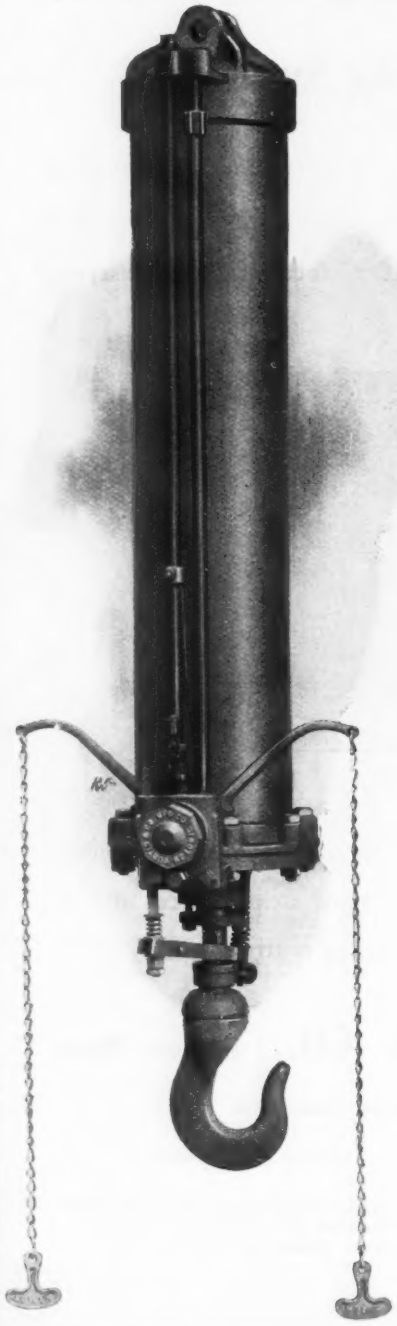
General Office and Works, HYDE PARK, MASS.

NEW YORK PHILADELPHIA CHICAGO LONDON

Designers and Builders of Heating, Ventilating, Drying and Mechanical Draft Apparatus; Fans, Blowers and Exhausters; Steam Engines, Electric Motors and Generating Sets; Fuel Economizers, Forges, Exhaust Heads, Steam Traps, Etc.

453

The CURTIS HOIST



AIR BALANCED

NO JUMP
OR JERK

Will Handle the Most Difficult Moulding

Made in sizes from 3″ diameter 450 lb. capacity, to 19″ diameter 20,000 lb. capacity.

PNEUMATIC ELEVATORS
AIR COMPRESSORS
OVERHEAD TROLLEY
SYSTEMS

Manufactured by

Curtis & Co. Mfg. Co.
ST. LOUIS

Baird Machinery Co., - - - - - Pittsburg
Strong, Carlisle & Hammond Co., - Cleveland
Walter H. Foster, - - - - - - New York
Hill, Clark & Co., - - - - - - Boston

If you know
of a foundry without a

Hanna Screen Shaker in use

tell us about it.

Large Tripod Shaker.

No foundry having either steam or air should be without one or more of our machines. Built in various styles. Capacity enormous. Operating expense small. First cost little.

Send for circular and particulars.

Hanna Engineering Works

820 Elston Ave., Chicago

—OR—

S. Obermayer Co., Chicago, Cincinnati, Pittsburg.
Edward J. Etting, Harrison Bldg., Philadelphia.
Thos. W. Pangborn Co., 42 Dey St., New York.

"SAY! DON'T SAY A WORD!"

"Just take my order for an elevator exactly like that, and get her out as quick as you can."

That's what a foundryman said the other day who came here to our works to see about an elevator.

There is not a man in the United States needing an elevator who would for a single minute even consider any other sort if he knew the Steam-Hydraulic.

We are placing them in large numbers in the best plants all over the land, and all we have to ask is, go and see one for yourself. A single visit will do the business for you and make you a Steam-Hydrauliker for life.

OIL GOVERNED AIR HOISTS.

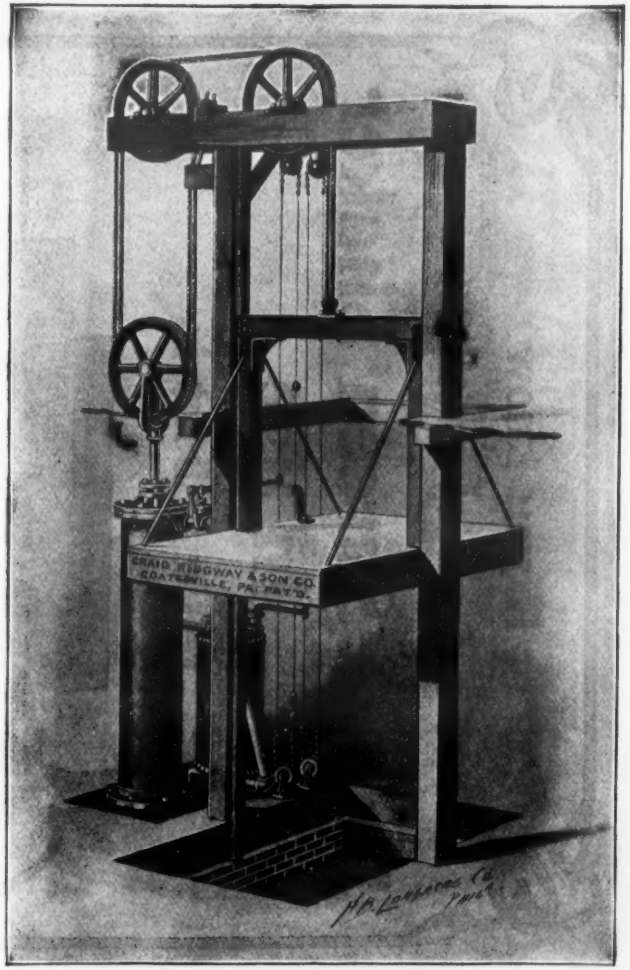
The only good kind—they'd tickle you.
Costs a little more to make them this kind.
Are worth the difference, however.

Please Take the Elevator
Hook 'er to the Biler.

Craig Ridgway & Son Co.

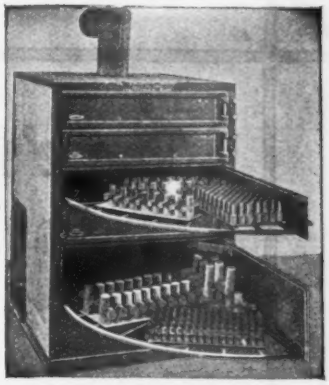
Coatesville, Pa.

European Agent, CHAS. C. ECKSTEIN, Kaiser Wilhelmstr. 49, BERLIN, GERMANY.



Rush jobs

call for quick core making and in many cases only the very best of cores will answer.

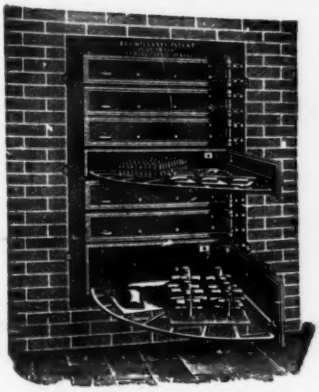


PORTABLE OVEN

Millett Core Ovens

enable your core makers to get the best of cores in the molders' hands in about half the time required by other methods. Hundreds of foundrymen have proven to their own satisfaction that

Millett Core Ovens



PERMANENT OVEN

produce better cores at less cost than any core oven made.

Send for list of users.

The Millett Core Oven Co.
Brightwood, Mass., U. S. A.

SALES AGENTS: S. Obermayer Co., Cincinnati and Chicago. J. W. Paxson Co., Philadelphia. J. W. Jackman & Co., London. J. S. McCormick Co., Pittsburgh, Pa. Thomas W. Pangborn Co., 42 Dey St., New York City.

There's Always a Best. In Pig Iron It's Pioneer.

A high quality iron that's always soft, strong, uniform and clean. Used everywhere by foundrymen who want money-saving results. Only carefully selected ores and fuel from our own mines and ovens used in its manufacture.

Cut out the loss from defective castings— use Pioneer.

The Republic Iron & Steel Co.

Chicago, Ill. **Birmingham, Ala.**

Sales Offices

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None So Good

Soft Strong Uniform

Cherry Valley Iron

ensures

quality in the cupola

secures

the best of castings

procures

the customers you want.

Send your orders early.

Cherry Valley Iron Co.

Pittsburg, Pa.

Superior Core Flour

A core flour that is always uniform. Makes a core that is very strong, peculiarly free from gas and not likely to blow. Binds from 50 to 100 per cent. more sand and runs lighter in weight than other foundry flours, thus reducing the cost of cores produced in your core room.

Wago Core Binder

Wago Core Binder will take the place of Oil, Resin or Flour, for large or small cores. Can be used from 30 to 60 parts of sand to one of Wago. Has more resistance to the Iron, cleans out easily and leaves a nice smooth surface. Makes very little gas or smoke and makes a core sharp in outline and as strong as oil sand.

The Buckeye Milling Co.

Cleveland, O.

"GLUETRIN"

"Fast bind, fast find"

Sticky As It Is,

and that means supremely sticky, the class of Founders who steadily stick to, and swear by Gluetrin Core Binder, would not be so "stuck on it" were it not for its "double barreled" cheapness.

Very early in the game they found that by reason of its penetrative ways it so thoroughly saturated a batch of sand, that even the most delicate and fragile cores made from that sand did not crumble, and dried quickly. When they came to use these cores, the practical absence of smoke showed that there was no blowing, and they noted this fact even when a proper venting was impossible. In short when they took the results uniformly secured by the use of Gluetrin Core Binder, and added to those results its small first cost, and the fact that there is no waste connected with it, they forthwith got the "Gluetrin habit."

To permit of a thorough test, we will ship to any responsible concern, a barrel of "Gluetrin," (prepaying freight charges) which barrel may be returned to us if it fails to give entire satisfaction.

P. S. Such samples do not come back to us.

Robeson Process Co.

(Successor to AMERICAN GLUTROSE CO.)

Camden, N. J., U. S. A.

"GLUETRIN"

is for sale by

The S. OBERMAYER COMPANY

from their houses in

CINCINNATI CHICAGO PITTSBURGH

and

THE HAMILTON FACING MILL CO., Ltd.

Hamilton, Ontario, Canada

ENCYCLOPEDIA OF FOUNDING

By Simpson Bolland 536 Pages Price $3

IN one sense of the word this book is a dictionary of foundry terms, yet it offers so much valuable information, not readily obtainable elsewhere, that its importance and usefulness is really far ahead of the simple title selected for it. The character of every material used by the founder is carefully explained, as is shown in the following paragraphs, selected at random:

Anthracite Facing. Finely ground Lehigh coal, which has been carefully selected for its freedom from impurities. It is one of the cheapest blacking-facings, and answers just as well as the dearer brands for rough work and cores when mixed with a small proportion of charcoal facing—especially as a wet blacking.

Malleable Bronze. Hard bronze may be made malleable by the addition of from ½ to 2 per cent mercury, which may be combined with either of the metals composing the mixture before the bronze is finally made. It can be put into the melted copper at the same time the tin is added, or can be used as an amalgam with the tin.

As a work of reference the *Encyclopedia of Founding* will be found useful in every shop.

THE FOUNDRY
CLEVELAND

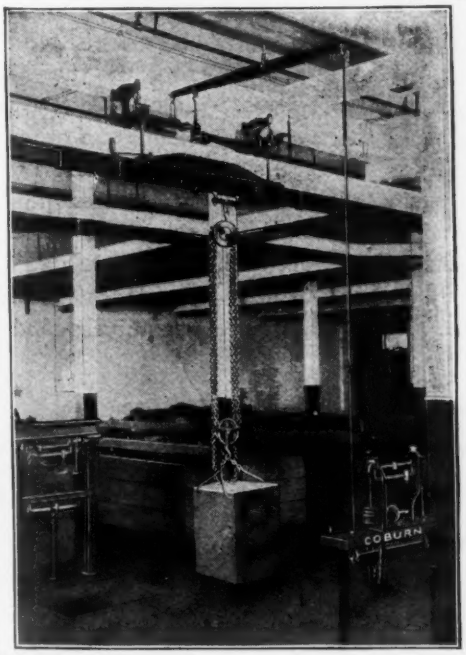
THE BENEVOLENT GIANT

EASILY CARRIES HEAVY WEIGHTS

It's astonishing with what ease heavy burdens of from one to seven tons are handled by the Benevolent Giant. He lifts as much as twenty men.

THE COBURN TROLLEY TRACK

Weighing load without rehandling.



Is a one man machine. It means that one man can do the work ordinarily requiring three and do it in half the time. It has revolutionized transportation of light or heavy loads indoors or out. Labor costs money and the Coburn Track is a labor saver.

Write for our catalogue.

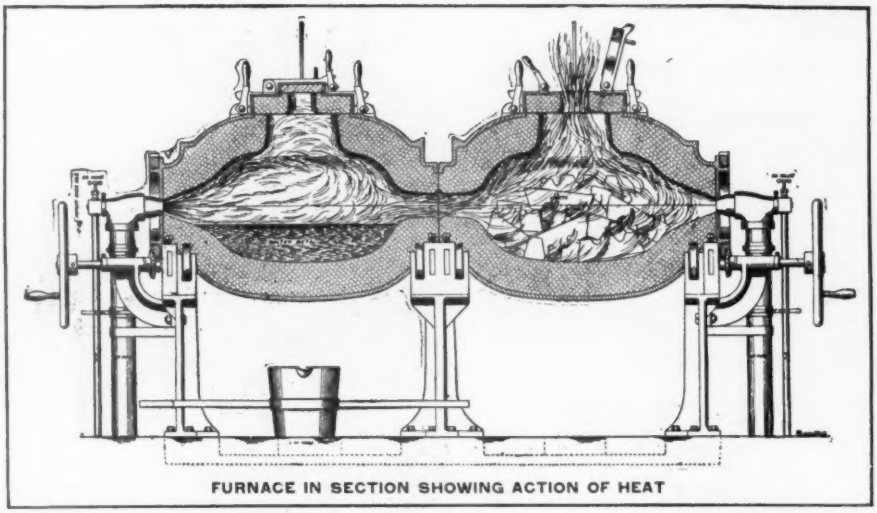
The Coburn Trolley Track Manufacturing Company

HOLYOKE, MASS., U. S. A.

Rockwell Rotary Melting Furnace

Entirely dispenses with crucibles

A saving all foundrymen will appreciate



FURNACE IN SECTION SHOWING ACTION OF HEAT

"The furnace that's always working"

The Rockwell Furnace is a sort of an alternating furnace. The fire is used at one end—the waste heat passing into the next charge—until the melt is completed, then the fire is turned into the other charge, which has already been brought close to the melting point by the waste heat from the other charge, so that the new charge is melted at once, the waste heat acting on the new charge as before, which means a continuous supply of molten metal, without stops or waits. No coal, coke or like fuel is used, so there is no dust or dirt, or waiting for the fire to come up. The Rockwell burns oil or gas, when not melting there is no fuel cost or loss. Started with a match. Stopped by closing a valve. For convenience, cleanliness and economy, it is unequaled.

Made in four standard sizes ranging in capacity from 350 to 3,000 pounds each chamber.
Catalogue on request.

ROCKWELL ENGINEERING COMPANY
26 CORTLANDT STREET
NEW YORK

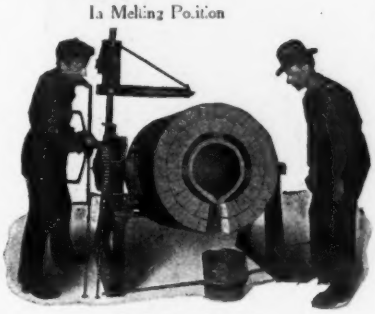
The "ACME" of Brass Foundry Requirements

The "STEELE-HARVEY" Crucible Melting Furnace

(Used with Oil or Gas and Air)

Standard Style

In Melting Position



In Pouring Position

Indispensable to Modern Founders of Electrical, Steam, Plumbers', Railroad, Chandelier, Lock, and Builders' Hardware, *Brass Goods* and smelters of Babbit and Solder Metals.

We guarantee that including labor, oil, and crucibles our furnace will melt all

BRASS FOUNDRY METALS

at lower cost than any other furnace. No *oxidation*. No *Clumsy hot hoods* or *expensive stacks* required. Furnace is placed in Foundry with only ordinary ventilation. Employees in the warmest weather can operate with comfort. Dispense with Coke Pits and the *contingent loss* of *metal* and *excess labor*.

Terms and Guarantee

Will ship upon approval. Instructions and expenses gratis. Our claims demonstrated. Payments arranged to satisfaction of purchaser.

Capacities from 50 to 900 lbs. per heat.

Write for catalogue stating your particular requirements.

MANUFACTURED BY

The Monarch Engineering & Mfg. Co.

BALTIMORE, MD.

Works: Curtis Bay, Md.

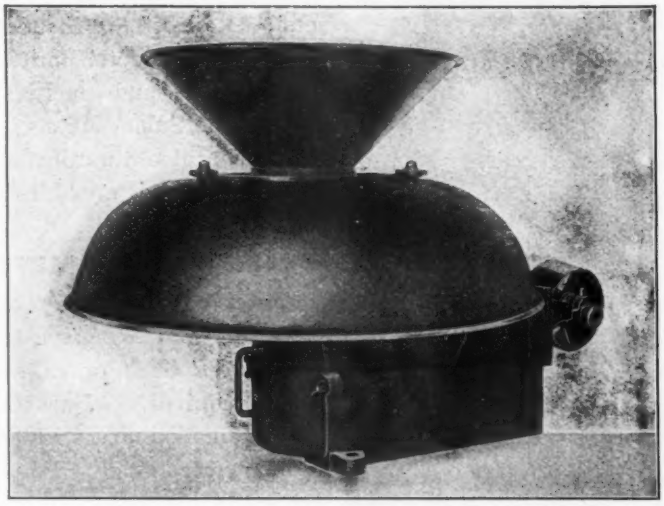
Exclusive Agents for Great Britain: Messrs. J. W. Jackman & Co., London, S. W.

William Sellers & Co., Incorp.

PHILADELPHIA, PA.

Modern Machine Tools

We illustrate hereunder one of our specialties for Foundry use, which has proved very satisfactory and profitable in service.



Centrifugal Sand Mixing Machine

We have furnished these machines to many users and shall be pleased to supply full particulars upon application.

TRAVELING CRANES JIB CRANES

SHOP TURNTABLES

Improved Injectors for Boiler Service

SHAFTS, HANGERS, PULLEYS, COUPLINGS, Etc.

FOR THE TRANSMISSION OF POWER.

This trade mark stands for the acme of crucible uniformity.

There's no guess work in the manufacture of a Taylor Crucible. Only the highest grades of material are used, and working strictly by our chemical analysis, we give a uniformity in the quality the year round, that is not approached.

A trial will convince you.

Robert J. Taylor, Incorporated

1900 to 1916 Callowhill Street

PHILADELPHIA, PA.

1827 — TO — 1905

78 YEARS OF
EXPERIENCE

DIXON'S

PLUMBAGO CRUCIBLES

EMBODY THE KNOWLEDGE AND
EXPERIENCE OF 78 YEARS SINCE
JOSEPH DIXON MADE THE FIRST
PLUMBAGO CRUCIBLE.

JOSEPH DIXON CRUCIBLE CO.

JERSEY CITY, N. J.

MANUFACTURERS OF THE WORLD'S BEST CRUCIBLES
FOR EVERY REQUIREMENT OF FOUNDER
AND METALLURGIST.

LET US HEAR FROM YOU.

The largest steel and brass manufacturers use McCullough-Dalzell Crucibles. They prefer them because they have been proved by actual test. Send us an order.

McCullough-Dalzell Crucible Co.

Pittsburgh
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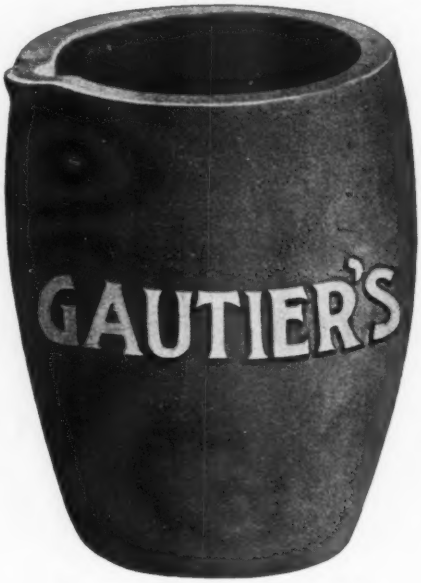
Crucibles that meet all requirements for all metals



For 50 years the standard of crucible excellence.

J. H. Gautier & Co.

JERSEY CITY, N. J.

The cost of good chaplets—

Lindsay Chaplets

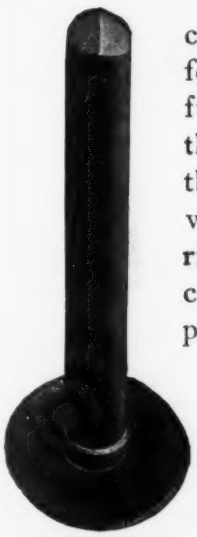
cuts but little figure in your

Foundry Expense

but the loss from defective castings resulting from the use of poor chaplets cuts a big slice from your

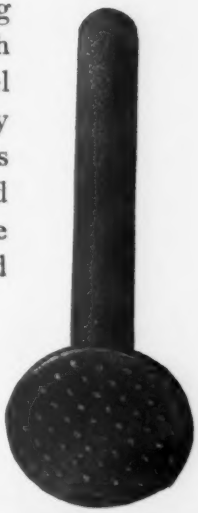
Foundry Profit.

Lindsay Chaplets



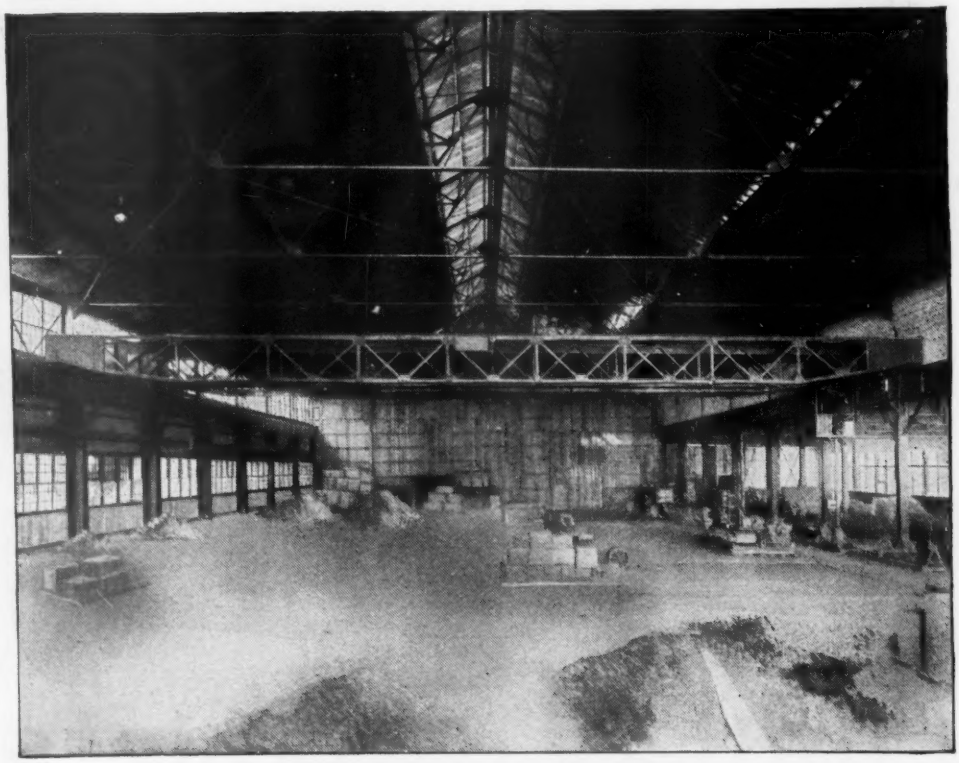
combine many time and money-saving features. Constructed of mild steel which fuses more readily with cast iron or steel than any other material. Easily shaped by the molder to any form required. Heads will not come off—cannot break—raised ring holds them in place should head be cut off in finishing. Lots of other good points.

Send for catalogue showing full line, or, better still, send a sample order and test these anti-blow-hole chaplets on your own work.



W. W. Lindsay & Co.

Harrison Building, Philadelphia, Pa.



Three-motor Electric Traveler, 10-tons capacity, 98-ft. span. Furnished McCormick Division, International Harvester Co., Chicago.

ELECTRIC TRAVELERS

CRANES OF ALL KINDS

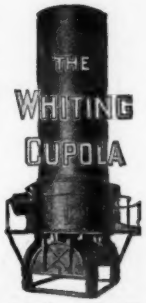
ENGINEERS, DESIGNERS AND MANUFACTURERS

COMPLETE EQUIPMENT FOR GRAY IRON, CAR WHEEL AND PIPE FOUNDRIES

MALLEABLE AND STEEL CASTING PLANTS

ALL TYPES

Catalog "F" on request



OVER 1500 IN USE

Awarded Gold Medal for Cupolas and Cranes at World's Fair St. Louis 1904.

WHITING FOUNDRY EQUIPMENT CO.

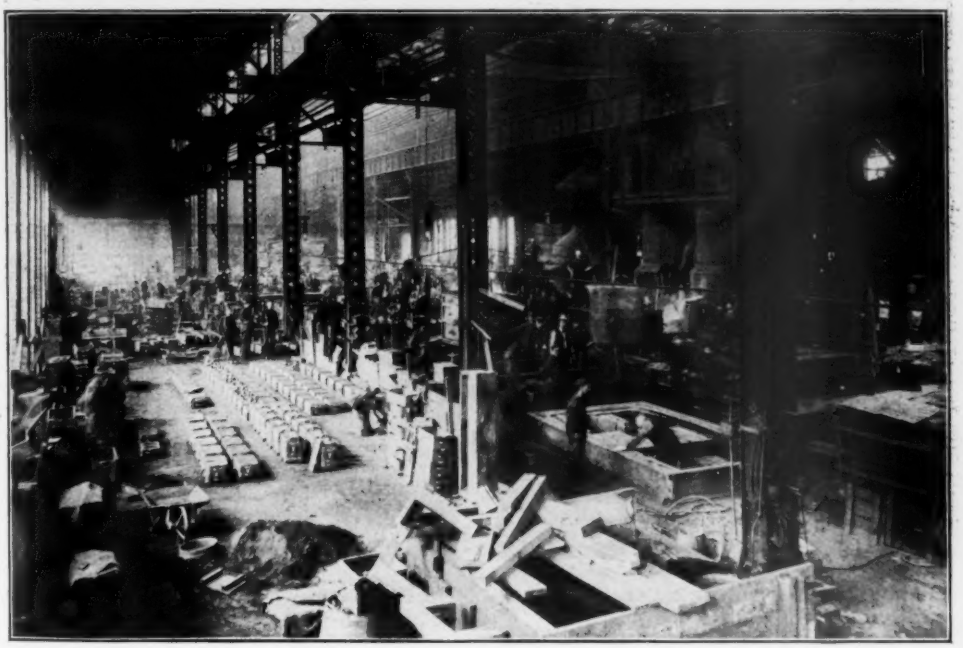
GENERAL OFFICE AND WORKS: HARVEY, ILL., U. S. A. (CHICAGO SUBURB)

THE FOUNDRY

Vol. 26, No. 6. *CLEVELAND, OHIO, AUGUST 1905.* *Whole No. 156*

Foundry Department of The National Transit Co., Oil City, Pennsylvania.

This is one of the foundry departments that it does a foundryman's heart good to visit. First, on account of the large volume of work handled and second on account of the fact that every piece of equipment and all of the departments show that everything is carefully planned and the work under the best possible supervision. It is an especially interesting plant on account of the fact that in one foundry are turned out ordinary grey iron castings, steel castings, and brass and bronze castings, all of high quality and many of them of exceedingly intricate design.



GENERAL VIEW OF FOUNDRY.

Grey Iron Foundry Equipment.

The main foundry is 120 ft. wide by 420 ft. long. The central span is equipped with three traveling cranes, two of which are 25-ton capacity each, and one 15-ton capacity. In addition to these there are a large number of jib cranes equipped with pneumatic hoists. As much of the work is duplicate it has been possible to make special rigging in the shape of well made iron flasks, specially prepared pits, etc. The foundry is located between two machine shops and hence as far as possible the work for each machine shop is confined to the end of the foundry adjacent thereto. There are two cleaning departments, each with its full equipment of tumbling barrels, grinding wheels, etc. One of these is located at each end of the foundry and in each the small castings for the adjacent machine shop are cleaned, thus reducing handling to a minimum. The cleaning department for the large castings is at one end of the foundry and under the main crane runway. As most of the

large castings are used in the machine shop next the heavy work cleaning room this does not necessitate the carrying of many castings the whole length of the foundry after they are cleaned.

There are over a dozen molding machines located in the side bay of the foundry for getting out light work.

The core-oven equipment consists of four large ovens of the following dimensions: One, 16 x 24 ft.; one, 12 x 30 ft.; one, 14 x 30 ft.; one, 10 x 30 ft., all being 8 ft. high. There is also a millet oven. The core department is located in the side bay opposite the molding machine floor and next the cupolas.

The melting equipment consists of two Callou cupolas, one 65 and the other 42 in. inside the lining. The stock of iron, coke, etc., is stored in sheds and in a yard at the side of the

STEEL CONVERTER IN BLAST.

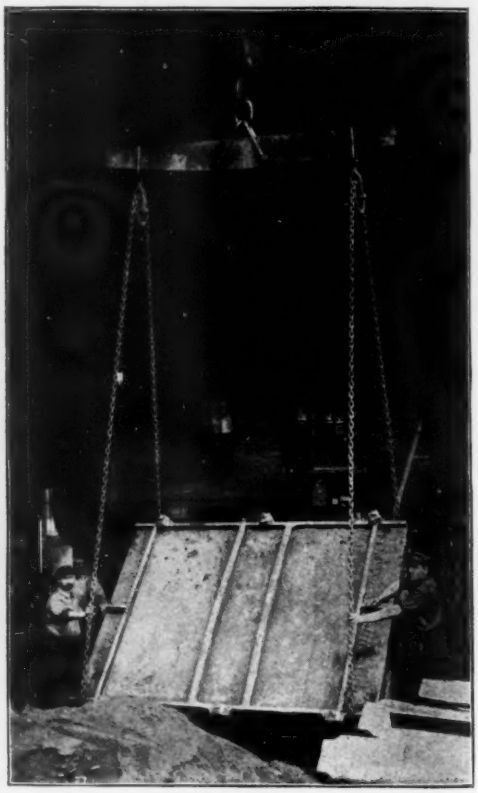
foundry and is raised to the cupola platform by an hydraulic elevator.

Storage bins are placed on one side of the foundry large enough for the entire year's supply of molding sand, sea coal, coke, and other foundry supplies.

For mixing and tempering the sand there are two pneumatic riddles and two power riddles. All the machinery about the plant is direct driven by electric motors.

Steel Melting Equipment.

Mr. J. E. Fisher, the superintendent of this foundry, is one of the pioneers in the Baby Bessemer Converter Practice, and has done a large amount of research work along this line. The steel melting equipment consists of a 4-ton converter made by Mr. Fisher. The molds for the steel castings are made on the floor and in the side bay adjoining the converter. Metal for the converter is melted in the smaller one of the cupolas and by suitable additions in the ladles all classes of special



ROLL OVER SLING.

alloy steels, including nickel steel, aluminum steel, etc., that are required in their work can readily be obtained.

One of the most interesting facts about the entire plant is the extremely small amount to remelt in the form of gates, risers, etc. They nearly always realize over 70 percent good castings and frequently come in the neighborhood of 80 percent. Mr. Fisher explained this on the ground that steel blown in this way is exceedingly hot and, hence, does not require as large gates and risers as would be the case with colder metal. Some of the intricate castings, such as cages for air com-

BRASS FOUNDRY.

pressor valves, etc., which have been made from nickel steel, certainly show remarkably good work.

In connection with the steel department, Mr. Fisher has developed an adjustable flask clamp which consists of two parts, one side of each being notched and the notches have a slight rake forward, so that when placed together and strained by wedging, the notches will tend to grip deeper. This device has proven so efficient that Mr. Fisher has put it on the market through the S. Obermayer Co., of Cincinnati and Pittsburg.

Handling Appliances.

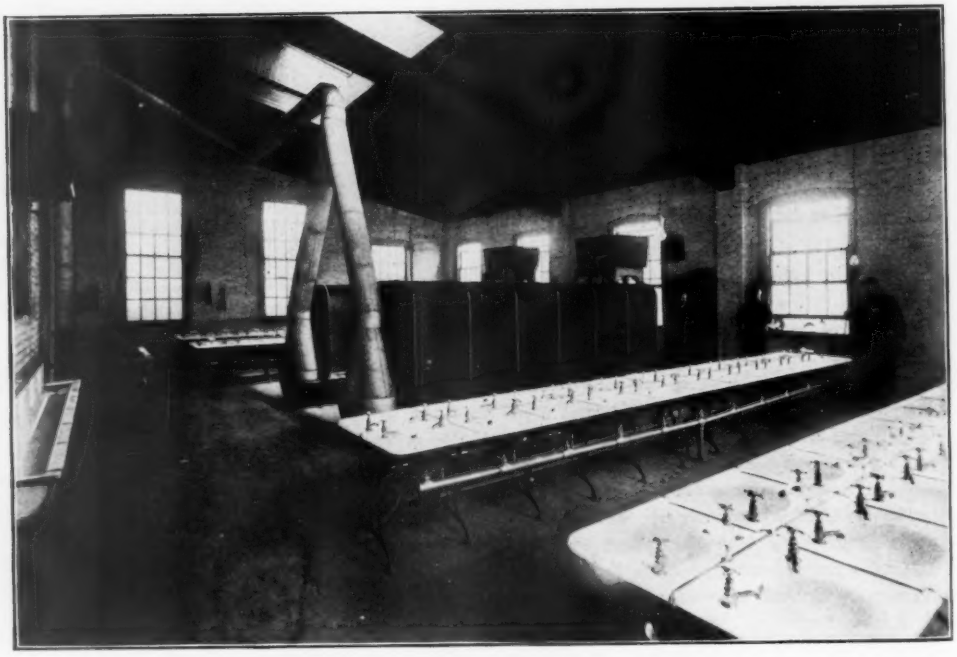
In addition to the cranes, trucks, etc., ordinarily used in handling there is a special device in use in this foundry gotten up by Mr. Fisher a good many years ago. This device was illustrated in *The Foundry* several years ago, but as it does not seem to be generally known we deem it is worthy of special mention. This is a roll or sling, which is shown clearly in one of the illustrations. It consists of a beam from which are suspended two sheaves over which run two chain slings. When a large flask is to be rolled over the boards are clamped on, the flask hoisted and then simply rolled over as it hangs suspended in the slings. When this kind of a sling is used, it is not necessary to depend upon trunnions on the flasks and all foundry men know how difficult it is to locate the trunions in such a way as to roll over the work with ease, while with the roll over sling the work adjusts itself in such a way that it is not difficult to turn it over even though it is of irregular form.

Brass Melting Equipment.

As the writer approached this foundry from the outside he stopped and studied the array of cupola tops, stacks, etc., showing on the outside. First there were two large ones which were iron cupolas, next to them was the stack from the converter. Then in the lower part of the roof next the railway there was a little cupola which was evidently used for melting brass, but from the small amount of oxide about the top it was hard to determine whether it was only used for an occasional charge or whether they had some special good practice in connection with it. An inspection of the brass melting department from the inside revealed still more interesting facts. This department is equipped with a cupola and a Schwartz melting furnace, but they find the cupola so efficient that practically all the brass and bronze used is melted in it. There is also a crucible furnace used for special mixtures when they are required.

The cupola in question is 24 in. inside diameter and the tuyeres are 8 in. from the bed. A fan pressure of about two ounces is used

CHEMICAL LABORATORY.



TOILET ROOM.

for blast. The charging door is situated 30 in. above the tuyeres and an excess of coke is used in melting, so as to insure a reducing flame under all conditions. In most cases the ingot copper only is melted in the cupola and the other ingredients that make up the alloy are added in the ladle. In some cases, however, ingot brass or bronze or heavy scrap are melted down in the cupola with perfect success. The 1,000-lb. Schwartz furnace is rarely used except for large castings, while the cupola is in operation every day.

For exceedingly heavy castings the steel converter is employed. This converter is provided with oil burners which project the burning oil through the tuyeres. These oil burners are generally used for heating the converter previous to a blow. When it is desired to melt brass or bronze in the converter it is turned down on its side and the proper amount of ingot metal charged. It is then melted down with a blast from the oil burners and the contents poured into a ladle which has been previously heated by an oil burner.

Chemical Laboratory.

An old saying is "Be sure you are right and then go ahead." In order to make sure that he is right in everything Mr. Fisher has a very complete laboratory in which analyses are made for checking all the work and in this laboratory will be found the secret of his success in the steel foundry and brass foundry practice, as well as in his gray iron practice.

NEW BOOKS.

"Engineers' Turning," by Jos. Homer, published by Crosby Lockwood & Son, Stationer's Hall Court, London, England. Price 9 shillings net.

This well known writer has brought out two books recently entitled "Tools for Engineers and Woodworkers" dealing with the small tools used in all departments of engineering work. The present books deals with what in this country is called lathe work. Comparatively little attention is paid to the practical style of the lathe itself. First the author calls attention to the fact that lathe design is now undergoing rapid changes due to the introduction of new high speed tool steels. The work contains over 400 pages and nearly 500 illustrations showing various classes of tools and appliances used in connection with lathe work, the methods of screwing and holding work during turning and a great many other very useful points in connection with this branch of shop work. In his preface the author calls attention to the fact that thus far there has been no book dealing specially with this department of shop work. Among the points of special interest are his treatment of turret lathes and turret work and what he has to say in regard to the new high speed tool steels. The work is certainly one which every progressive machinist will want and also one which should be in the hands of any one having this class of work in charge.

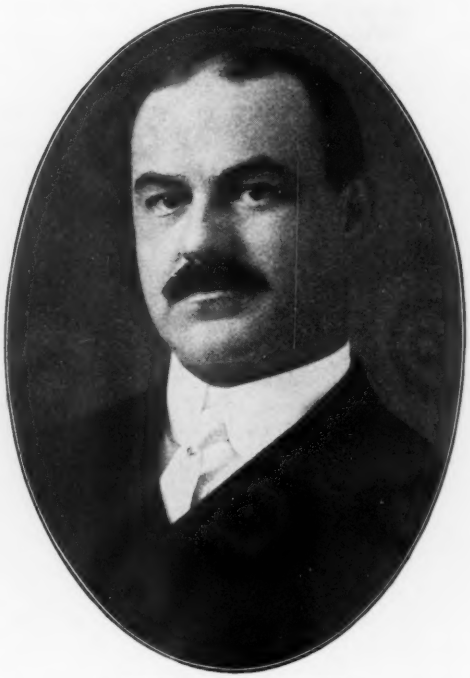
"Organizing a Factory," by C. E. Woods, published by the System Co., of Chicago and New York. Price $1.50.

This is the second of a series of books comprising "The Business Man's Library," which are being put out by the System Co. The matter contained in the book is largely drawn from a series of articles written by Mr. Woods and published in System. The author, however, has gone back over the work very carefully and has added whatever was necessary to make a connective story of the entire volume. In the preface the publisher states that as a rule we cannot learn to do a thing by merely being told how it is done, but that such knowledge greatly facilitates our learning how to do it when once we get into practical work. It affords him a strong foundation, barren and useless in itself, but a firm basis upon which to build the structure of business experience. Book learning, abstract knowledge, is like a fertilizer: it does not, of itself, produce anything, but it stimulates growth and advance when the live seed, practical experience, is instilled in the soil of work. Following this idea the author has aimed to give in the fewest possible words a comprehensive treatment of the new art of organizing a factory. Some of the chapters are as follows: The Necessity of System and New Methods, The Organization Elements and Authorities of an Industrial Body, The Accounting of Expenses and Costs, Analysis of Different Methods of Paying Labor, Depreciation of Tools and its Relation to Costs, The Machinery of Cost Getting, Perpetual Inventories, How the Executive may keep in touch with the Factory, etc. The volume contains 156 pages of good solid meat.

The Des Moines Bridge & Iron Works, Des Moines, Ia., are to build a $35,000 addition to their plant, to be used as a foundry.

A. W. SLOCUM

National Car Wheel Co., Pittsburg, Vice President of A. F. A. for Pennsylvania, Delaware, Maryland, and District of Columbia.



HENRY A. CARPENTER

A. Carpenter & Sons, Providence, R. I., Vice President of A. F. A. for New England States.

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T. J. BEST

Warden, King & Co., Montreal, Canada, Vice President of A. F. A. for Canada.

H. E. DILLER
Western Electric Co., Chicago, Ill., Secretary of Metallurgical Section of A. F. A.

F. C. EVERITT
New York, Secretary of the Associated Foundry Foremen.

A COMPARISON OF STANDARD METHODS FOR TESTING CAST IRON.*

BY DR. RICHARD MOLDENKE.

In reviewing the situation as it exists today, we see that all the work carried through in connection with the testing of cast iron, lies in the direction of standard specifications. The only nations which have accomplished something definite are Germany and the United States. The others are still working at the problem.

As pig iron is the basis of the foundry industry, our attention is first directed to it, and we find two general specifications in use—the American ones, and lately a pig iron contract drawn up in England. In the American specifications we have the direct recommendation that all iron be purchased by analysis. Next detailed instructions for sampling. The course to pursue in case of a disagreement in the analytical work. An important omission, and one which it will take much time to supply, is the lack of standard methods for analysis. Without these, even the best specifications still leave a loop-hole for controversy. Incidentally it may be said that the American organization of foundrymen is taking this matter up, and has already prepared a standard method for determining silicon in pig iron and cast iron. Total carbon is to follow, then sulphur, and so on. As these methods are tested out in practice outside of the foundrymen's organization, we will learn their practical value for specification purposes better.

Continuing with the American pig iron specifications, we next come to the allowances and penalties. Here there is given the limit of difference allowable in the pig iron delivered from that specified, and the penalty that may be exacted where the limit is exceeded, and yet not be too great to absolutely reject the metal. These provisions enable foundries to purchase pig iron with a reasonable assurance that they get what they want nearly enough, without causing the slightest trouble in the shop routine. The cash penalty further prevents the furnace from taking chances on shipments to people who watch their supplies carefully.

For the benefit of the trade in general,

*Read at the Atlantic City meeting of the American Society for Testing Materials.

inasmuch as only the minority of foundries are equipped with laboratories, or have expert advice, there is given a table of base analyses of grades, so that if a man pins the specifications to his order, and calls for a number three iron, he will get just what a number three iron should be in composition, so far as the silicon and sulphur are concerned. When the use of chemistry in the foundry is so general, and the furnaces are run in such a way that one iron is as good as another, we may see these specifications extended to include the other elements. At present the phosphorus, manganese, and carbons, are questions of brand and locality largely, the furnace industry being quite settled in classes for pig iron distribution.

Germany has not yet seen fit to standardize pig irons, and reports from the other side indicate that conditions are not so favorable there, the application of our American specifications being out of the question for German irons. A man calling for pig iron with the sulphur we give, and be it said that our sulphur limit is high, would have to pay fancy prices in Germany, for they are badly troubled with that element over there. The same may be said for England, and on looking over the new pig iron contract issued by the London Metal Exchange, we find that while the sulphur allowed is not much larger than ours, yet the very much higher silicon that goes with it practically makes a big difference. Thus while we have a No. 2 pig iron run 2.25 silicon, with a variation of 10 percent either way or 2.00 to 2.50, and this has a maximum of 0.045 sulphur allowed, the English standard, with the same sulphur, allows the silicon to vary from 2.50 to 3.50 percent which would correspond to our No. 1 with a higher sulphur. The English specifications also give rules for sampling, but lay much stress upon the brand names.

Incidentally it may be mentioned that America is taking up the question of standardizing foundry coke, which is a step in advance, and will have a far-reaching influence not only in foundry practice but on the blast furnace.

To turn now to specifications for testing cast iron. In America we have adopted a set for pipe, for locomotive cylinders, for malleable castings, and there are pending those for castings in general, and for car wheels. Over here we take out from the general work the special groups which can stand by themselves and have properties peculiarly their own, which may be determined by specific tests. In Germany they have specifications for machinery castings, for columns, which we are trying to get away from as quickly as possible; and for pipe.

In dividing the classes of castings relative to their thickness, for this is the important point to consider when specifying breaking strength, we have adopted a little wider limit than the Germans. Thus we have small castings at ½ in. and less. They have 0.6 in. and less, or a little more. For medium castings, however, we have from ½ in. to 2 in. The Germans have from 0.6 in. to only 1 in. For heavy castings we have over 2 in. in thickness, and they have over 1 in., which shows that our conception of heavy castings is a little different, or else that German customs lay more stress on smaller limits for medium castings.

A further difference between the American and the German specifications may be found in the chemical end. We specify the upper limit for sulphur, so as to secure reasonable strength against shock. This is not looked after in the German specifications, possibly because of the difficulty in getting low sulphur irons for the foundry.

The point that interests us most, however, is the method by which the metal is judged. That is the test bars employed. Comparing the general specifications advanced for Germany with our own, now pending, we see that special pains are taken in both cases to get representative test bars, and these are not to be cast on the piece. Herein there is a distinct advance, cutting off the old coupon. The transverse test is prescribed, which agrees with our experience. The tensile test is omitted entirely in Germany, and it is to be hoped that we may follow suit in this some day also, as no good end is served when no two testing machines may agree in the alignment and grip on the specimens.

We find a radical difference in the length of the test bars used. Our own are comparatively short, and this has caused com-

ment on the other side, our German brethren concluding that we do not lay as much stress on the transverse test as we should. We, on the other hand, believe that with the long bars in use formerly, much of the sensitiveness of the transverse test is gone, for even poor iron will show good results, if the test is carried out slowly and carefully. On the other hand with a comparatively quick test on short bars, the iron must be of good quality to show a good deflection and strength.

Three bars are provided by the Germans. For small castings the diameter is 0.8 in. and the distance between supports 16 in. For the medium castings the figures are 1.2 in. diameter and 24 in. between supports. For the heavy castings the diameter is 1.6 in. and the testing distance 32 in.

It will be noted that the German aim is evidently to get as near the size of the castings to be represented as possible, and this is to be commended in a way. However, we realize over here that the lack of homogeneity in the structure of cast iron is such an element in the problem that the records of several sized test bars are not mathematically comparable, as would be the case in steel. Hence we would not feel safe to accept the result of a long and thick bar as compared with a shorter and thinner one, in order to judge whether the iron in one is better than that in the other.

While realizing that it is desirable to vary the diameter of the bars, but not the length, we reluctantly confined ourselves to one bar for all purposes, aiming only to get at the actual quality of the metal with given standard conditions identical for each test, so far as foundry practice can accomplish this. We can therefore discriminate between metal wanted for light, medium and heavy castings at a glance, and without making a comparative calculation, the results of which are open to doubt.

The German specifications for casting the test bars go us one better in requiring the vertical pour but from bottom up. We await their results on this, with interest, as we use the ordinary top pour, but so arranged that the metal drops to the bottom through a funnel-shaped gate, and the mold is thus made cheaper.

German specifications call for the bars to be made in flasks that are not parted, if possible, so that the test bars have no seams. If, however, this is unavoidable, the test bar is to be so placed that when tested the seam lies in the neutral axis. We prefer to prevent the making of test bars with seams altogether by giving complete specifications for the flask itself, which any foundry can arrange for without particular trouble.

Both specifications agree in having the bars cast in dry sand, and the cooling of the bars in the flask. Furthermore, only brushing is allowed in cleaning the bars, and no machining is to be done.

In judging the tests themselves there is a difference between the two specifications in question. We specify just when the tests are to be arranged for in the heat, and that one of the two bars cast at the various casting intervals must pass the requirements. The German specifications call for three bars, the average of which must be taken, defective bars to be excluded. In both cases the expense of testing falls upon the founder. In our added tensile test, this when required by the purchaser, is to be paid for by him.

The clause in our specifications wherein we allow the buyer the freest run of our establishments, in order that he may be satisfied that the material is gotten out in the best manner possible, does not appear in the German specifications. Only in the case of pipe is there mention made of facilities to be given the inspector to watch the testing of this material.

It is still a little early to draw conclusions from the specifications advanced, for they have either not been officially adopted by their respective countries, or they are still in the trial stage. This much can be said, however, that a marked advance can be recorded, for in everything presented so far the attempt has been made to build on our increasing knowledge of the properties of cast iron as a metal. Much has of course to be yielded to business expediency, for the industrial customs of a nation cannot be radically disturbed without laying ourselves open to the charge of being idealists and dreamers.

The buying of pig iron by analysis, and now by specification, may be said to be the most radical advance the foundry has ever made. The adoption of specification for the castings is gradually coming into

vogue also, and we will soon see the allied industries, such as the fuel, sand, facings, etc., become a subject for study and final specification.

It is to be hoped that at Brussels next year, we not only may report final specifications for all we have undertaken in the way of cast iron, but that Germany, England, France and Austria may be similarly situated. Then we can compare notes, and possibly adjust some of the items so as to have a greater conformity in practice.

THE WATT CUPOLA TUYERE.

The Watt tuyeres have now been in use for a number of years, but many foundrymen are not familiar with them. Any tuyere which introduces into the cupola large jets of air at high pressure is liable to chill the slag and iron as it descends past the tuyere, while accretions are liable to form between the tuyeres, sometimes to such an extent as to ultimately bridge the cupola. Many attempts have been made to produce a continuous tuyere which would not interfere with the support of the cupola lining and which would give the blast an equal opportunity at all points of the inside of the lining.

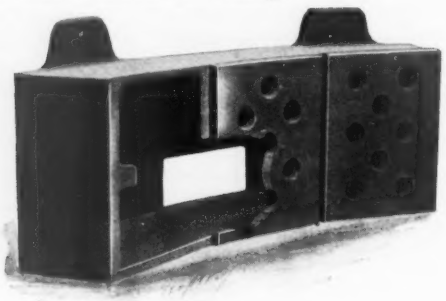

FIG. 1. BLOCK FOR TUYERE.

In the Watt tuyere this is accomplished by having an outside wind box, and inside of the lining a series of cast iron blocks or boxes, each of which is supplied with air through an opening in the back, as shown in Fig. 1. The front of this block is closed with metal plates which are provided with lugs on the back side, which simply hook over corresponding lugs in the block. These plates are perforated with holes as shown. The result is a very large number of small jets of air, which approximates a continuous tuyere closely enough for all practical purposes. These perforated plates can be quickly lifted out and replaced. The main blocks serve to support the lining, and the fact that the perforated plates are always kept cool by the flow of air through them prevents the

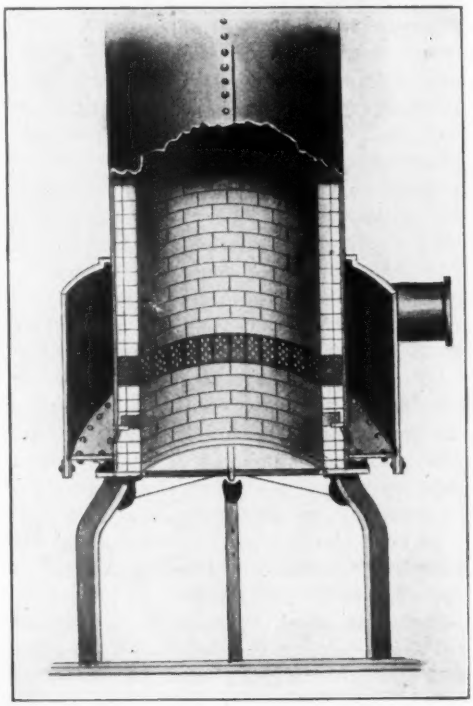

FIG. 2. SECTION OF CUPOLA.

burning away of the lining at the upper edge of the tuyeres.

Parties who have used this tuyere for some time report perfect success in maintaining a uniform blast and in keeping the tuyere in repair. They also claim that their cupolas work much better, and melt faster and cleaner than with the old style of tuyeres. A section of a cupola fitted with Watt tuyeres is shown in Fig. 2.

These tuyeres are made by the Watt Cupola Tuyere Co., Barnesville, O.

TRADE PUBLICATIONS.

The American Engine Co., of Boundbrook, N. J., is sending out a map of the United States and its island possessions, together with a small map of Cuba, beneath which there is a calendar covering a period from July 1, 1905 to December 31, 1906. The map is surrounded by the portraits of all the presidents of the United States above, and in

the lower corners there is a small amount of advertising matter covering the products manufactured by the American Engine Co.

The Northern Engineering Works, Detroit, Mich., have issued a new edition of their crane catalogue, No. 20, containing illustrations of cranes for all purposes both for indoor and outdoor use. The catalogue first contains a statement as to what is necessary when sending in inquiries or quotations on cranes. This is followed by a description of the standard traveling cranes including illustrations of the entire crane and of the trolleys, also of some of the crane details. There are many styles illustrated, including cranes especially designed for location in which the head room is limited. Electric yard cranes are next taken up and dwelt on very fully, showing the various applications and the manner of installing the cranes. Some of the cranes illustrated for indoor and outdoor use are arranged so as to be operated from the floor, while others are operated from a cage. The transfer tables made by this company are next illustrated, both for transferring railroad and other cars and for transferring trolley hoists. Under the subject of trolley hoists a very large variety of equipment of this kind is described and fully illustrated, showing the advantage of the different classes, including those in which the operator accompanies the trolley in a cage and those which are operated from the floor. Pneumatic hoists of various types are also fuly treated. Various types of jib cranes for indoor and outdoor work are illustrated, several of the illustrations being taken from photographs of those in use in foundries. Under the head of Pillar Cranes quite a variety of machines is illustrated, some equipped for hand power, others with pneumatic hoists and still others operated with steam or electricity. Various types of locomotives and truck cranes are also fully illustrated. The crane user should be able to select equipment for almost any of the varying conditions met with about plants from the types illustrated in this catalogue.

The Ingersoll-Sergeant Drill Co., 26 Cortlandt street, New York City, has issued a catalogue dealing with the "Little Jap" Hammer Drill, showing how this tool may be applied to drilling stone as well as to work of an ordinary pneumatic hammer.

The Smooth-On Mfg. Co., 572 Communipaw avenue, Jersey City, N J., has issued a new catalogue especially devoted to its Smooth-On elastic cement. The publication is entitled the "Smooth-On Elastic Cement Instruction Book." This material is the latest development as a result of this company's experiments with metallic fillers for repairing all classes of iron and steel work. The book describes the material fully and illustrates its use of a number of examples.

The Brown & Sharpe Mfg. Co., of Providence, R. I., have issued their 1905 catalogue of machinery and tools. This catalogue has been revised and a good many new machines and devices illustrated in it. Some of the old matter has been re-written and arranged in a better form. This catalogue contains so many handy tables and so much useful information that it should be in the hands of all who have to deal with metal work, and especially in the hands of metal patternmakers.

A. M. Thompson, of Penn 10156 Wallace street, Chicago, Ill., has published a catalogue describing the Thompson Adjustable Clamps. There are numerous illustrations showing various applications of these useful appliances and a large number of letters from foundrymen who have found the use of these clamps advantageous.

SPECIAL NUMBER OF THE HORSELESS AGE.

The Horseless Age, published in New York, has brought out a special number devoted to commercial automobiles. It contains eighty pages of reading matter upon this subject, to which very little attention has thus far been given. It brings out the progress which has been made in this way, in a remarkable manner. Not only are the many different classes of trucks and vans described, but the engines and gearings for some of them are very fully illustrated. There is also an article on commercial motor car tires. One very interesting article treats of the running cost of commercial automobiles.

RUTHLESS RHYMES.

Bill, the apprentice, spit into a sprue
He wanted to see what the iron would do.
At the funeral the neighbors sighed:
"Bill was a good boy. Too bad he died."

A helper too near the cupola strayed
He wanted to see how iron was made.
He didn't know hot iron would burn;
Isn't it strange how some people learn?

Tom poured hot iron into a mold
Then stripped the flask before it was cold.
Though the boss was irritated,
All the men were quite elated.

—W. S. ZIMMERMAN.

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CONTENTS.

Foundry Department of the National Transit Co. 257
New Books 261
A Comparison of Standard Methods for Testing Cast Iron..... 263
The Watt Cupola Tuyere..... 266
Trade Publications 266
Trade Outlook 268
Hard Cast Iron 269
Sweeping a Cylindrical and Conical Drum 270
Practical Alloying 276
Core Sands 281
Use of Thermit..... 289
A Molding Machine Patent..... 290
General Industrial Notes..... 292
Cast Iron Notes..... 292
Buoyancy of Cast Iron..... 292
Spongy Spots in Thin Castings..... 292
Malleable Cast Iron Notes..... 293
Brass Foundry Notes..... 294
Shot Iron 294
Cement for Sidewalk Glass..... 294
Hot Cracks in Steel Castings..... 294
Associations and Societies 296
Personals 297
Deaths 298
Fires 299
New Construction 300
General Industrial Notes..... 301

TRADE OUTLOOK.

During the first part of the past month there was little change in the foundry situation, but during the last portion of the month there has been a marked increase in the buying of pig iron, large orders having been placed in Chicago, Cleveland and Cincinnati. It is true that much of this buying has been at very low prices, but nevertheless it has served to strengthen the pig iron market and to make some of the pig iron interests hold for higher prices. It is to be hoped, however, that the furnaces will not attempt to run up the price too much and thus bring on another period of dullness in all the manufacturing interests dependent upon pig iron as a base.

Number 2 foundry iron is quoted at the Valley furnaces from $14.00 to $14.35 per ton for immediate delivery. None of the furnaces, however, will sell for future delivery below from $14.25 to $14.50 per ton. Southern iron is now held at $11 furnace, for No. 2 foundry, and some interests are holding for $11.50.

There seems to be a good demand for foundry coke and it is held at from $2.25 to $2.40 per ton at the ovens in the Connellsville region.

The conditions with regard to the division of work in the foundry industry remain very much as they have during the past few months. Some of the special foundries, steel works, malleable foundries, etc., are running full time or over time. The light hardware foundries are picking up to quite an extent, though few of them are running full handed. The general jobbing foundries are as a rule fairly busy on heavy work, and some of them have a considerable amount of light work on hand also.

HARD CAST IRON.*

By Henry Souther.

A consulting metallurgical engineer in contact with machine shops is accustomed to hearing complaints from the operators of machine tools of hardness of material being machined. Sometimes it develops, especially with steel, that the trouble is not that the steel is hard; but, on the con-

*Presented at the Atlantic City meeting of the American Society for Testing Materials. Mr. Souther is of the Henry Souther Engineering Co., of Hartford, Conn.

trary, that it is exceedingly soft. The softness is of such a character that the edged tool does not succeed in cutting the steel keenly, but rather tears it off, some of the particles clinging to the edge of the tool, causing excessive friction and rubbing, and drawing the temper of the tool and dullness soon follows. The effect as far as the machine operator is concerned is that of a hard steel; the tool is spoiled. This not only applies to low carbons but to a peculiar physical condition of higher carbons, say, in the neighborhood of .50, due to bad annealing.

Then there is the legitimate hard steel, which is really hard in the true sense of the term.

Cast iron that chills may be called hard in the truest sense of the word. That is the complaint that is most often met when the term hardness is used in connection with machining cast iron. Iron chills because of high sulphur or low silicon, or a combination of both, and machine tools simply can not cut it. This kind of hardness is more often found in thin work than in thick work. For example, the hardware people casting very thin material have to use the softest of iron, high silicon and low sulphur, in order that the small amount of machining they do may be done at all.

In the last five or six years three separate complaints of hard iron have reached the writer and proved of so baffling a character that in each case visits were made to the machine shops working the iron, and the complaint carefully investigated. Analysis or test did not reveal the cause.

The most instructive case covers them all. This instance was most informing because it occurred on a multiple drill where several different sizes of standard drills were used and several thicknesses of metal were involved. On approaching the machine it was noticeable at once that there was trouble, because the drills were screeching in an unusual way.

It developed that small drills, ¼ in. or thereabouts, were standing up with this iron just as well as any other, but the larger drills in the neighborhood of ½ in. and ¾ in. were dulling exactly as though the iron were charged with emery. The edges were being ground off and would last only a fraction of the time usual for the same drills in the same machine.

Here was an unusual condition, thin iron working easily; thick iron on the same castings working with difficulty.

The chemical results were normal, except manganese—silicon 2.50, phosphorus .70, sulphur about .080, total carbon 3.50 and manganese .16.

The fracture of the iron was good and, moreover, it was quite normal as far as could be seen with eye or microscope. A Keep's test drill was used and developed nothing unusual, no signs of hardness, thick and thin iron showing a normal curve. There was no opportunity to test the tool wearing qualities on the Keep machine, because the drill was sharpened after every hole drilled.

Inasmuch as the only abnormal part in the analysis was shown in the manganese, that element was suspected, although there seemed to be no metallurgical reason for so doing. Means were taken to raise it to the neighborhood of .50 and as soon as this was done the difficulty disappeared in the machine shop and has not reappeared after some months.

It is a complaint which reached me, as I said above, from two other sources, and in both of those sources the complaint was described by the machine shop people by saying that the iron was "gritty." They were fully convinced that there was sand in it, but examination showed that to be out of the question and the iron was as clean as any iron.

This leads me to believe that there must be some carbide of iron or carbide of silicon that forms in the absence of a reasonable amount of manganese, and that does not form with manganese present. What this chemical combination may be I cannot surmise, but the problem presented is an interesting one from a theoretical and practical standpoint. Apparently its cure has been found, but the question remains, Why?

The actual castings causing this trouble were put through and no specimens kept, so that the writer can furnish no samples for study, but this is doubtless something that comes before the other members of the society and although specimens may not be easy to get, they can doubtless be found.

SWEEPING A CYLINDRICAL AND CONICAL DRUM.

BY H. J. M'CASLIN.

The accompanying illustrations show a combined cylindrical and conical hoisting drum with a variable pitch score, and also one method of sweeping the same in loam. These drums, two in number, form a right and left when placed together, and were designed by the Wellman-Seaver-Morgan Co. and cast by the Interstate Foundry Co., under the supervision of Mr. A. L. Hott. They were used in the construction of an electric automatic water hoist, in an anthracite coal mine near Scranton, Pa. This design of hoisting drum is employed in winding heavy loads from deep mines. When the skip or load is at the bottom of the mine, ready to be hauled up, the winding of the cable begins at the small cylindrical end. This prevents the load from starting too suddenly, and allows the slack cable in the shaft to be gradually taken up at the beginning of the hoist. The motor or engine also gains a decided advantage when these drums are employed, as the winding starts at a slow speed and gradually increases, thus giving the motive power a better chance to do its work, and reducing the strain to a minimum.

Fig. 1 gives a cross section of the drum; to the right is shown the metal thickness, and to the left the bolting flange with its splitting margin along the joint and around the bolt holes. The drum is cast practically entire, and subsequently split in two. It will be seen that the drum is 16 ft. in diameter at the large end, and 10 ft. at the small end. The conical section is very flat, and increases from the small to the large diameter in four revolutions. Fig. 2 gives plan of drum at the small cylindrical end, showing ribs, bolting flanges, etc.

As the rig or device employed in producing conical drums of this description is one of the principal features, upon which the accuracy of the work greatly depends, its calculation and construction usually receive the initial attention, therefore we shall proceed likewise.

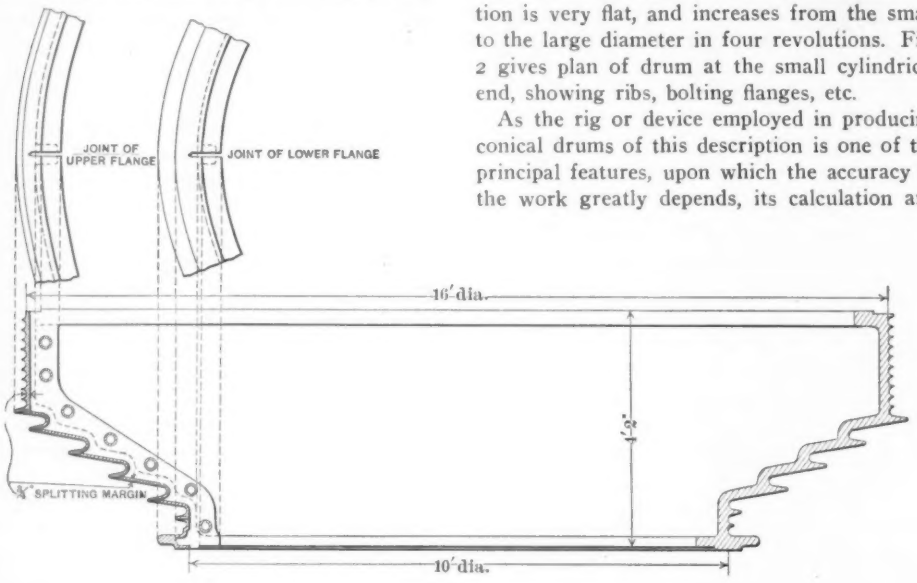


Fig. 1

The variation in the axial pitch of the drum score was produced by a variable pitch thread cut upon the cast iron hollow spindle, as illustrated in Fig. 3. This thread receives the conical roller A, which is provided with a roller bearing bracket, B, as shown in plan and section, Fig. 4. The outer diameter of the Spindle is turned to the required dimension, six inches, the variable pitch thread is laid off, and holes drilled at the points where the pitch of thread changes. The spindle is then returned to the lathe, and the required pitch of thread between the drilled holes cut, the spindle being finished at the top and bottom as shown.

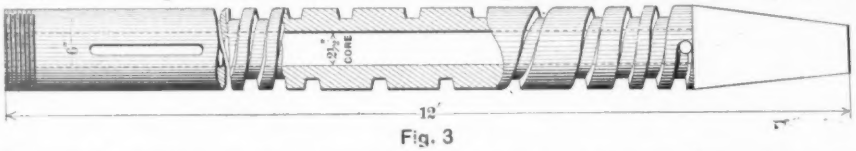


Fig. 3

Three views of the assembled device are

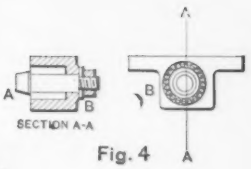


Fig. 4

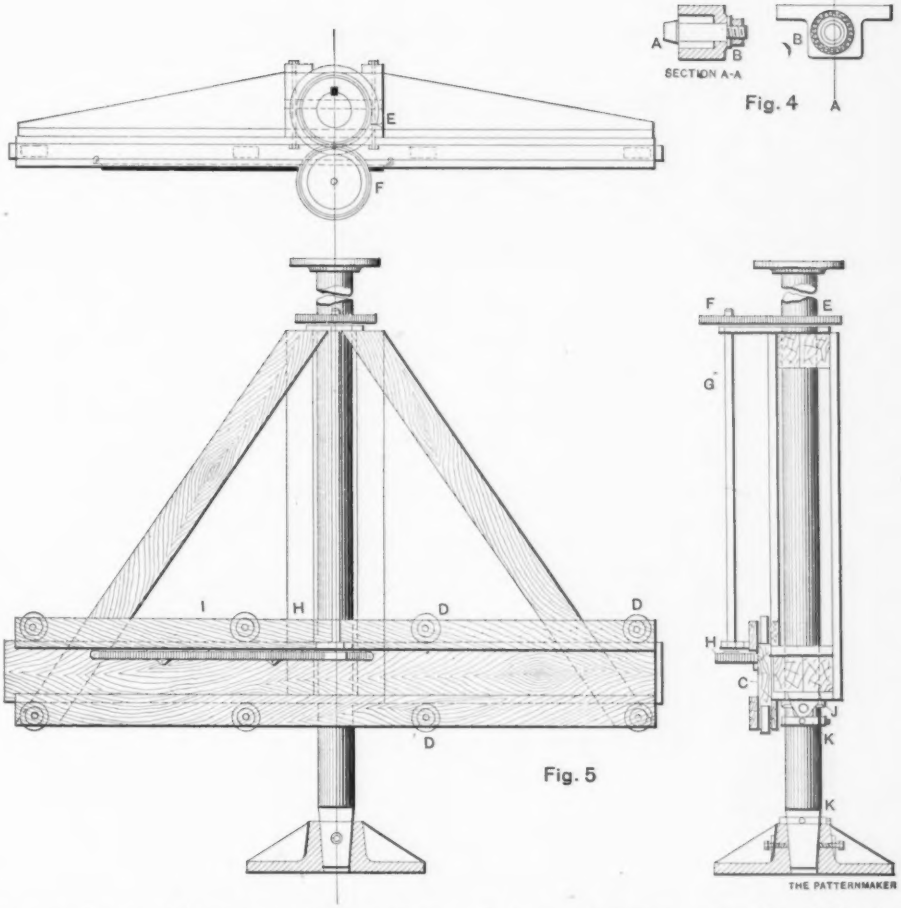


Fig. 5

shown in Fig. 5, giving the general construction of the frame. The material used is hard wood. The sliding arm C is held in place as shown, and with the aid of rollers D, is allowed to travel or slide freely. Gear E at the top of the frame is attached to the spindle with a feather key, permitting it to travel up and down the spindle as the frame is raised or lowered. As the frame is revolved around the spindle, gear E drives gear F, which, by means of shaft G, pinion H, and rack I, causes the sliding arm C to travel radially backward or forward, as the case requires. The raising or lowering of the frame is governed by the engagement of the conical roller A, with the thread of the spindle. The bracket B is located and secured to the lower part of the frame at J. The proportion of gears governing the travel of arm C during the sweeping of the conical section of drum is as follows: The angle of the conical section is 120 degrees, giving a 9-in. throw to the 5-in. pitch; that is, the frame would rise 5 in. in one revolution, while the arm C would travel outward 9 in.

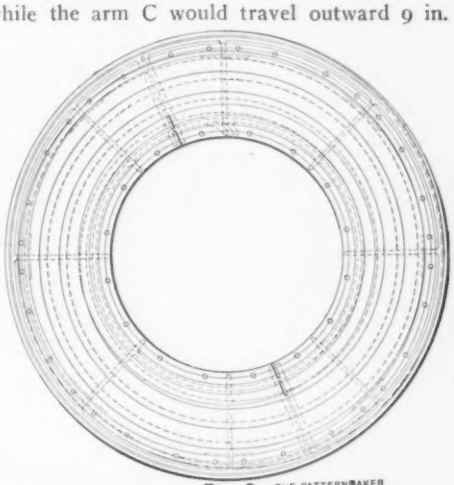


Fig. 2 THE PATTERNMAKER

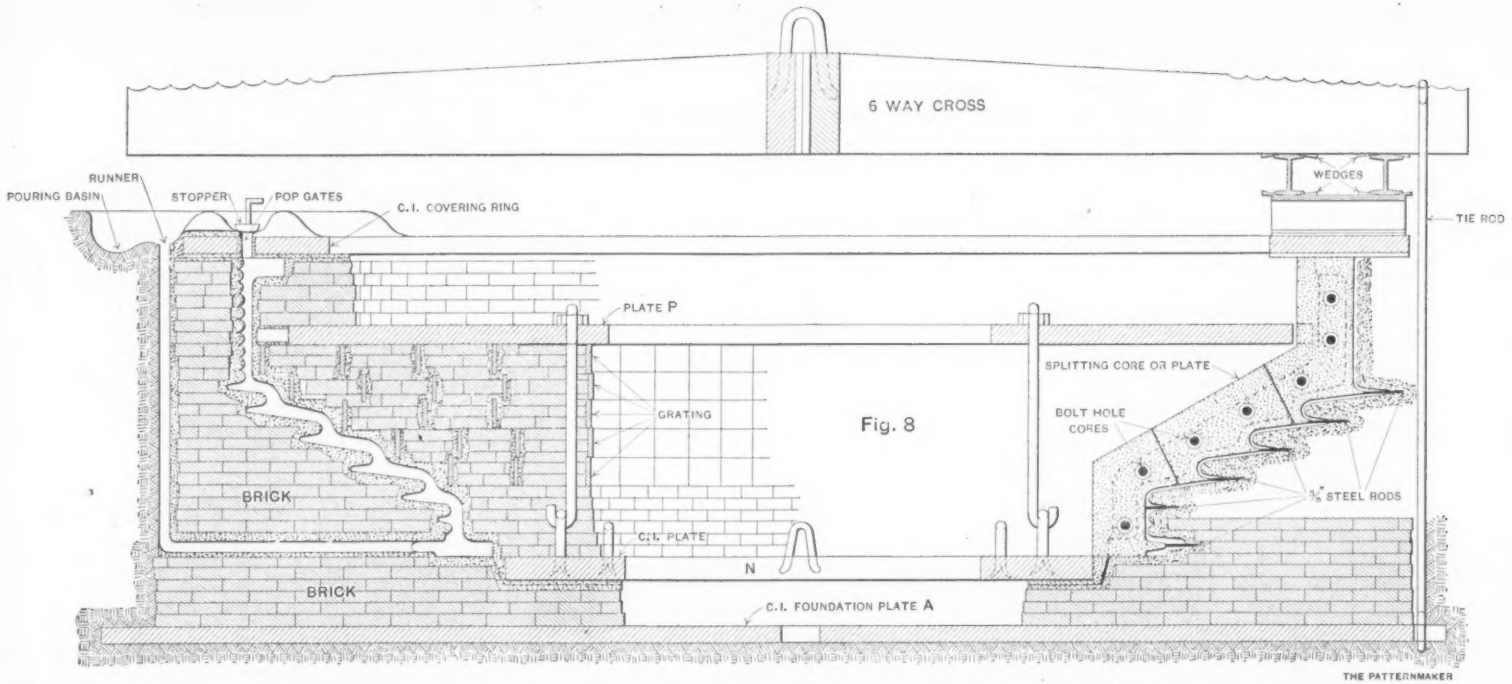


Fig. 8

The gears are of ½ circular pitch, gear E and F having a pitch diameter of 10.15 in., and 64 teeth; gear H contains 18 teeth with a pitch diameter of 2.86 in. These proportions give the gears the same number of revolutions as the frame.

When using the frame with the arm C stationary, as in the sweeping of the cylindrical sections, gear E is thrown out of mesh with gear F by being raised up and a block or support placed underneath it. This also requires the disengaging of the roller from the thread of the spindle. The frame is now held suspended and revolved upon the collar K; the collar being dropped down upon the spindle socket when not in use, as shown in dotted lines.

Sweeping the Mold.

The pit having been dug to the depth of the drum, a bed is struck off for foundation plate A, which is placed in position and leveled up with the spindle socket attached, as illustrated in Fig. 6. The socket is bushed as shown, to receive an ordinary spindle, to which is attached the sweep C. The brick work is now built up to the required height in the usual manner, and a heavy facing of loam applied and struck off to the form of the sweep. The cutting edge of the sweep forms the seat for the core, and also a surface and guide for

placing flange D, which is shown in position to the left.

Fig. 7 illustrates the rig in operation, showing the arm with the various cutters and strikes attached, which are employed at the different stages of sweeping the mold. To the right are shown the cutters G, H and I, required in forming the score. They are made of ⅜-in. steel plate, dressed to form and the back beveled off, forming a comparatively sharp edge. To the left are shown the strikes J and Z, employed in sweeping on a body of sand the equivalent of the metal thickness.

With the seat for core prepared and flange D in position, the scoring of the mold is in order. Following the plumbing of the spindle, the frame is lowered down over it, and the upper end secured with guy rods attached to flange L. With the roller engaged with the thread of the spindle, and gear E thrown out of mesh with gear F, the frame is placed in position at the starting point, this being governed by the thread of the spindle. The slide with cutter G attached is next adjusted to the required diameter of score, and the slide locked in position, as shown to the right at the starting point. The brick work with a heavy loam facing is struck off to the form of cutter along its helical path, is now laid until the conical section is reached. Cutter H is now attached to the slide as shown, gear E dropped into mesh with gear F, causing the slide to travel outward as the frame is revolved. As the changing of these cutters and pitch of scoring is rather abrupt, a little doctoring or making up of score becomes necessary at this point, and is accomplished with the aid of a segment representing a section of scoring. The segment is so dressed that it works from one section to the other. This mending up also becomes necessary when the large conical and cylindrical sections meet, at which time cutter I is attached, and the bricking and scoring completed to the top.

At the top a surface to receive the covering ring is struck off with the aid of strike M, attached to the slide, as shown to the left. This necessitates the throwing out of the gears and conical roller, the frame being supported and revolved upon the collar K. With this portion of the mold completed and air-dried, a body of ordinary sand, equivalent to the metal thick-

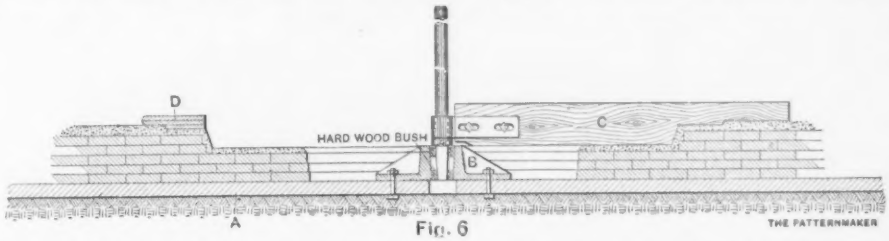


Fig. 6

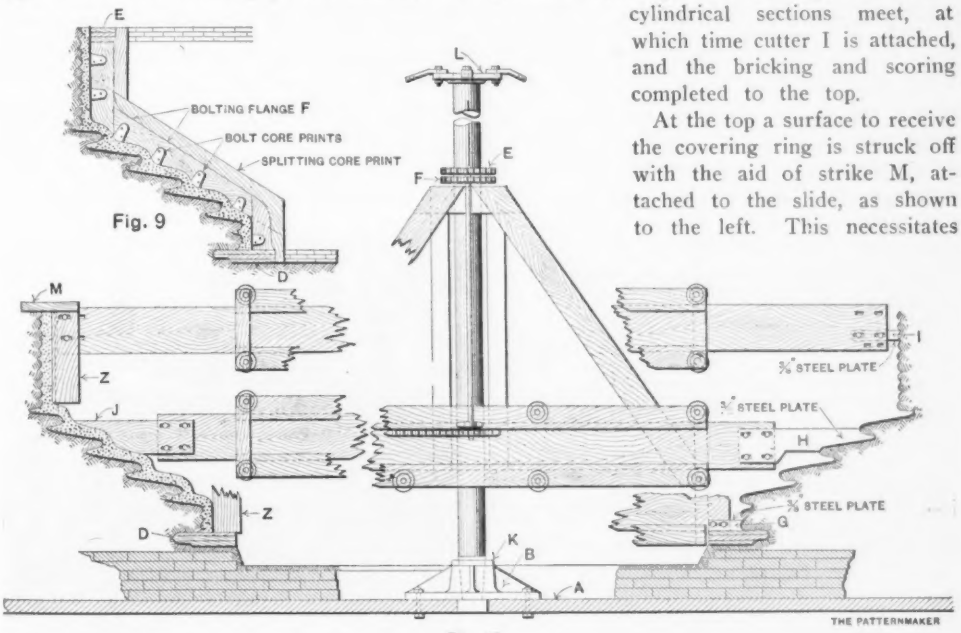


Fig. 7

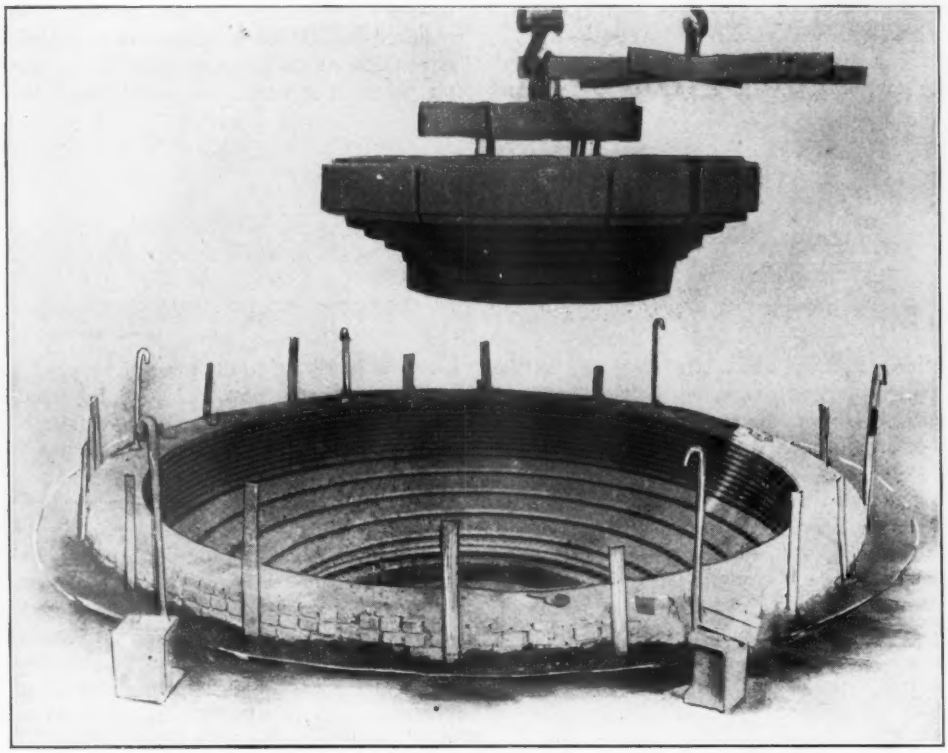


FIG. 12. MOLD WITH CORE SUSPENDED ABOVE IT AND SIX-WAY CROSS FOR CLAMPING ALSO HANGING ABOVE.

ness, is then swept on. The gears and conical roller having been disengaged, the strike Z attached, and the slide locked to the inside diameter, the frame is lowered until the strike clears the flange D, and the collar K adjusted. This thickness of sand is now swept up on the small cylindrical section of the mold, as shown.

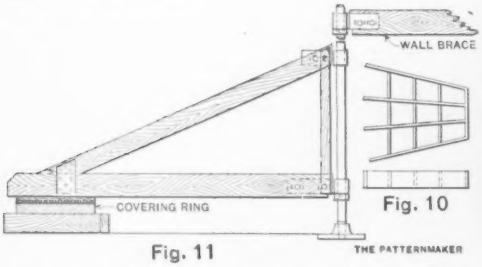


Fig. 11

Fig. 10

The conical section being reached, the strike J is attached, the conical roller engaged with the thread of the spindle, and the gears dropped into mesh and this thickness of sand swept on the conical section. The large cylindrical section is treated like the small section, strike Z being employed. The frame and spindle are now removed, paper applied to the seat for the core, a heavy loam facing spread over it, and the lifting plate N, upon which the core is built, as shown in cross section of mold, Fig. 8, pressed down upon it;

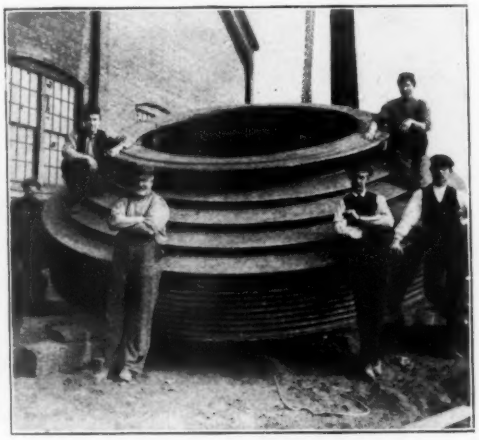


FIG. 14. FINISHED DRUM.

to which it adheres, forming a seat and guide for locating the core when returned to the mold. The ribs and bolting flanges F, with

FIG. 13. MOLD WITH SWEEPING RIG IN PLACE.

splitting and bolt core prints attached, are now placed in position. They support the flange E, as shown in Fig. 9. This flange and flange D are in sections, which allows their being drawn in or back, as the case requires. The arrangement of ribs, etc., is screwed together, the screws being removed as the building of the core progresses.

Building the Core.

The bricking, strengthened with rods and plates, having a thickness of loam between it and the molding sand thickness, which represents the metal thickness of the drum, is now placed upon the lifting plate N, Fig 8, until the conical section is reached. Open sand grates, as shown in Fig. 10, are now employed to secure the overhanging brick and loam, the grates increasing in length as the building of the core progresses. The small end is kept somewhat in line, allowing the sixteen clamping bolts to pass up through them. The height of the conical section is built up in this manner; plate P is placed upon the grating with its filling of brick and loam, and this portion of the core securely clamped together. Brick and loam are now applied to the top of the plate, and the remaining portion of the core completed and the top finished, as shown. A center line for splitting core is now laid off across the top of the core and outer wall of the mold. The lifting plate is provided with four staples, as shown. The core is lifted from its seat with the aid of a four-way cross, as shown in Fig. 12, and placed upon a car, the ribs and flanges drawn, the core dressed and placed in the oven and dried. The lower flange is drawn and the sand forming the metal thickness is removed from the mold, it is then treated in the usual manner, and thoroughly dried by the aid of coke fires placed in it. Owing to the deep scoring of the conical section of the drum, the splitting of the projecting metal between the score is an object to be considered. This can be overcome to a nicety with ⅜-in. steel rods in the following manner.

By the aid of a plumb-bob and straight-edge across the top of the mold, the center line of the drum at the splitting core is projected down the side of the mold, and ⅜-in. machine steel rods driven in opposite these projections, as shown to the right in Fig. 8. Fig. 8 also shows the splitting and bolt cores in position. The bolt cores are placed through the splitting core, but independent of it, being secured by the tail prints, leaving a ¾-in. metal thickness around the bolt holes. The splitting core consists of a perforated ¼-in. cast iron plate,

covered with loam, forming a core of about 5/8 in. in thickness. To facilitate the handling and setting of these cores, and to lessen the danger of the cast iron plate warping or expanding when heated from the metal, thus causing the loam to crack and chip from the plate, the cores are made in three sections. A complete core box is used, the cores being separated by the introduction of pieces of tin at the desired lengths. The splitting preparations being completed, the mold is ready to be assembled.

The core is lowered into place, and the cope ring placed on. The ring consists of a cast iron prickered semi-ring, or plate, provided with lifting lugs and openings for gates. To the prickered surface a heavy facing of loam is applied, and struck off with the aid of a spindle and sweep, as shown in Fig. 11. The clamping of the mold is accompanied with the assistance of a six-way cross in a very positive manner. Foundation plate A is provided with lugs corresponding with the arms of the cross, and the tie rods are attached to it, as shown. The crane is now hooked on to the cross, and given a heavy lift, and while being subjected to this strain, the blocking between the covering ring and cross is placed in position and securely wedged up. The intervening space between the wall of the mold and the side of the pit is firmly rammed in with sand. The runners, two in number, are located opposite each other, and are prepared during this ramming or backing up.

The gating to the lower flange is not on a radial line, as shown to the left, Fig. 8 (this being simply for illustration), but is carried farther around the flange so as to cause the metal to whirl or circulate as it rises in the mold; this provision being necessary to offset the tendency of the metal to become sluggish or chilled as it nears the top.

The pouring of the mold does not depend entirely upon the gating from below, as the mold is provided with a series of pop gates closed with cast iron stoppers and connected with the pouring basin, as shown. During the pouring, and when the metal has reached the top of the conical section, the ladles are tipped, choking the runners, and causing the metal to back up over the pop gates to the depth of three or four inches. The stoppers are now lifted out, causing the metal to drop into the mold.

A photograph of the mold during the operation of sweeping is shown in Fig. 13.

A view of the mold with the core suspended from one crane immediately behind it and the six-way cross for tying down the cope suspended from the other crane near it, is shown in Fig. 12. The finished casting is shown in Fig. 14.

PRACTICAL ALLOYING. I.

Metal Refining: Ancient and Modern.

BY J. F. BUCHANAN.

To the average individual the universe is a mass of organic and inorganic substances regulated by the inscrutable laws of an All-wise Providence; to the philosopher, it is simply "harmonious matter:" but to the student of applied sciences it presents an inexhaustible medley of forces and elements which lend themselves to analytic and synthetic arrangement. Thus, in the view of the scientist, the spectroscope and the balance may be said to prove all things, whilst the blowpipe and the melting pot enable him to hold fast that which is good. It is the province of science to investigate. The chemist and the physicist have to determine the nature and limits of all the material things in their ultimate relations. We may take pride, therefore, in the long and ever increasing list of elementary substances compiled by the noble army of workers who have endeavored to unravel for us the mysteries of earth and space. The ancients supposed fire, air, earth and water to be the fundamental constituents of the universe, and these compounds are still known in literature as "the elements." Modern science, however, defines the simple or elementary bodies as "those substances which do not admit of analysis." Up to the present time over seventy such substances have been isolated. They are recognized as metallic and non-metallic bodies, but the metals are an overwhelming majority. The distinction between a metal and a metalloid (which is the technical designation of a non-metal), is a purely artificial one, based on physical rather than chemical standards. The metals are characterized by the possession, in varying degrees, of a wide range of properties, as ductility, malleability, fusibility, metallic lustre, sonorousness and thermal and electrical conductivities. The useful metals are electro-positive and with few exceptions they readily combine with electro-negative bodies, such as oxygen, sulphur, chlorine, etc. Consequently, the largest bulk of the metals in the earth exist in the mineral state, as ores, requiring a separation of the components before they can be put to any practical use. It is with metals as with everything else in nature—the useful

members exist in greater abundance than do those of more superficial qualities.

Copper, lead, tin, iron, gold, silver and mercury appear to have been known from a remote antiquity. They are mentioned in Holy Writ and there is every reason to believe that they were applied in many ways by the Egyptians, Persians, Hindoos and Chinese, in the earlier epochs of human history. Obviously the crude methods employed by the ancients for the reduction of the metals greatly restricted their application. Their rude furnaces would reduce only the richest ores in small quantities and very imperfectly. The early history of metallurgy is somewhat obscure. Egypt—the birthplace of astrology, alchemy and the liberal arts, and the first of old-world empires—is known historically and by exploration as the home of many manufacturing processes, indicating a comprehensive knowledge of refractory materials, especially earths and metals. The Egyptian potters and refiners have been the models for artists in form and color down the generations. Pre-historic metal workers were undoubtedly engaged in fashioning such metals as are known to exist in the "free" or native condition. The seven elements already mentioned, with possibly a copper calamine compound, sometimes called golden-copper or native brass, comprised the stock-in-trade of the metal workers up to the beginning of the Christian era. Sacred and profane histories and the ancient mythologies contain many references to the metals and metal workers of that early period, so that Tubal Cain, Vulcan, or The Cyclops, are names typical of metal workers unto this day. Exactly how much knowledge of metallurgic processes the early artificers possessed it would be difficult to surmise; but their skill in handicrafting metals for architectural and decorative purposes is beyond dispute. The Bible has made us familiar with some of the early metal refining processes, products and appliances.

The fire, the pure metal, and the dross are always related as cause and effect. Gold is mentioned as being refined with silver (which sounds like the first alloy on record), and Job says: "Surely there is a place for gold where they find it;" and again, "Iron is taken out of the earth and brass is molten out of the stone." Here let me explain that the word "refining" is applied, in technical circles, only to the later stages of the metal extraction processes, indicating the separation of impurities from metallic compounds; but, it has an older and more comprehensive significance, making it embrace all the operations of reducing as well as purifying and alloying metals; and in order to avoid tedious distinctions, I take the liberty of using the term in its widest application.

Practical alloying, or the art of refining metals and alloys of metals, is an ancient pursuit which has led to many important discoveries; it has also been greatly instrumental in furthering the progress of mechanical science. It is always interesting and instructive to trace the arts and inventions to their origins. A new idea may cause a sectional uneasiness, but an old one never loses its power to guide and uplift the activities of the race. When the world was young and the children of men had leisure to dream, the interpreter of visions was a power in the land; magic became a fine art and astrology the first science—music and hieroglyphics following in natural sequence. Husbandry was the essential occupation of mankind until he learned that he could not live by bread alone. Worship made calls on his better nature, and these were answered, mistakenly, but sincerely, in the graven images of the semi-barbarous peoples. Even Israel, the chosen race, lapsed into idolatry. Thus, Aaron's golden calf became the forerunner of frequent failures as well as the first recorded work in metal founding. Such a beginning was befitting this industry, for there are heaps of gold and many misguided workers engaged in founding metals, even now. Did not Jeremiah establish his reputation as a prophet when he said: "Every founder is confounded by the graven image." Incidentally, the destruction of this golden calf sheds some light on the manner of reducing metals in those early days. Moses "took the calf and burnt it in the fire, and ground it to powder, and strewed it upon the water." These processes are characteristic of some ancient methods of gold refining, and the granulation of metals by strewing them upon water is still practiced in the manufacture of hard solders and shot metal, as well as in some of the modern methods of extracting metals from the earthly matter with which they are generally associated.

In all ages it has been the aim of the metal refiner to bring out and enlarge the useful qualities of the metals, and the progress of metallurgic processes in recent times demonstrates the desirability of having the practical arts based upon scientific principles. We have learned that the chemical properties of most metals are such that only their salts are found

in nature; but the ancient refiner, with his four "elements" and many empirical laws, made slow advances and few discoveries in the working of metals. Up to the time of Pliny, or the beginning of the Christian era, the metals were reduced, smelted and mixed with scarcely any definite application of chemical knowledge and with little or no effort to get rid of impurities, excepting, perhaps, in the case of the precious metals—gold and silver. Casting operations were necessarily restricted. Alloys other than the natural product of the ordinary smelting operations were practically unknown. A few mechanical processes, as the calcination and cupellation of metals, served for the separation of the noble and ignoble elements; and the proper use of fluxes had not yet been discovered. In the middle ages the alchemists were fired with the hallucination of making gold. They formed into leagues; worked in secret upon some mystical formula; adopted signs, zodiacal and religious; and aimed, at different periods, to discover, first, an alkahest, or universal solvent; second, the philosopher's stone—a substance for transmuting base metals into gold; and third, the elixir of life—a liquor supposed to have the power of prolonging man's existence.

These dreams of the alchemists—like the dream of perpetual motion—are still unfulfilled, but Utopia is always in the future, and every new discovery seems to stir up hope in the prophetic truth of human imaginings. Scientific, like other history, repeats itself. Men pursue old fancies and discover new forces by the way. Recent researches seem to be overturning laws which scientists of former periods were at great pains to determine. Thus, with the advent of radium, Dalton's atomic theory is said to be in danger, the law of the permanence of matter is in a precarious position, and if it be true that uranium and other metals develop radio-activity, the greatest dream of the alchemists—the transmutation of metals is likely to materialize.

The desire for gold is much older than King Midas. The mystics and magicians of the early Egyptian and Persian civilizations indulged in transmutation theories. It took centuries of alchemical research to dissolutionize the later schools about the gold-in-everything craze. The disappearance of the Magi and the fall of the Roman Empire opened up the way for the development of systematic chemistry and the introduction of the new industrialism. Our increased knowledge of the cosmos has been of infinitely greater value than the mere discovery of an alkahest; nevertheless, we are indebted to the alchemists, and to the minuteness of their searchings, for the philosopher's stone, for the discovery of many invaluable processes and startling phenomena in the realms of chemistry and physics, and also for introducing to us that group of interesting bodies, termed the metallic alloys.

Chemistry and metallurgy are so intimately related that they require collateral study; they are allied as theory and practice in metal refining processes. Chemical science may be said to lay down the law, and be the theoretical basis of metallurgic operations, while metallurgy, viewed as a manufacturing art, and by right of its historical precedence, may be considered as the practical foundation of chemistry. Art and empiricism have always preceded science and dogma. Astrology precedes astronomy. Alchemy preceded chemistry, and the ancient metal refining processes paved the way for the more complete metallurgy of today.

Passing from the ancient to the modern aspects of metal refining, we are confronted with the immensity of the subject. A brief summary of the processes involved in the reduction and refining of one of the metals would require a book—and a better writer. Having regard, then, to the scope of these articles, we must be content with a general survey of the vast field, focussing the simple principles and the more important methods of smelting and alloying metals, down to our own times. Ores may be described as chemical compounds of metallic and non-metallic elements, from which the metals are generally obtained "by promoting a change in the chemical equilibrium." The nature of the operations by which metals are extracted from their ores depends on the chemical affinities of the metals to be extracted.

Nature works by a system of laws and affinities; and, in treating metals, the best results have been obtained by imitating the processes by which metallic compounds are built up or dissociated in nature. Of necessity the metallurgist is forced to observe the chemical reactions following upon the elaborate processes involved in the separation of gangue or earthy matter from the purely metallic constituents of an ore. The ores from which most of the metals are obtained occur in such great variety of combination and in such diverse conditions that no general system of treatment could be devised for the reduction of any one class.

Metallic oxides, sulphides, carbonates and silicates constitute the majority of the minerals yielding the useful metals.

The value of an ore depends upon the metals it contains and upon its susceptibility to metallurgic treatment. Very often the presence of the "precious" metals influences the choice of a refining process and necessitates more careful handling and more exhaustive treatment of the ores. But the metallic content is not always the most important consideration in the treatment of an ore. Some ores contain sufficient suitable fluxing material to reduce the metallic contents in the form of "coarse" metal; others lack this excellent property and have to be fed with artificial fluxes. In recent years, many low grade ores, which could not be economically reduced in former times, have, owing to the more exhaustive and economical reactions of modern metallurgy, and the manufacture of practical by-products from the materials of reduction, been increased in value beyond their intrinsic worth.

Metals may exist in any of the three states of matter, solid, liquid or gaseous, the condition varying with and being nearly always determined by the temperature. The possibilities in the way of metallic combinations are infinite. Metals combine with each other and with other elements in nature, producing compounds the decomposition of which demands a close observance of chemical and physical laws, as well as an intimate acquaintance with the mechanical processes of refining. The association of different elements and the chemical conditions binding them together can only be broken up by the application of suitable chemical reagents. Heat is the principal agency by which the cohesive force of materials is diminished, and it is because the application of heat promotes the operation of the laws of chemical energy that the metallurgist is so strongly addicted to the agency of fire.

The treatment of the ores for obtaining the metals is mechanical and chemical. The mechanical treatment is preliminary to the roasting and reduction processes and consists in crushing, washing and classifying the ores according to their richness and the nature of the gangue. The process is known as concentration and its action is based upon the different specific gravities of the substances which are associated in the ore, advantage being taken of the different speeds at which their particles will subside in a column of water. Ores which are mineralized in large masses, or crystals, are adapted for coarse concentration; on the contrary, ores which contain the valuable mineral in a finely divided state must be crushed finer in order to liberate the finer particles.

The degree of fineness to which an ore should be crushed depends on the nature of the mineralized ingredients. The solvent action of water eliminates worthless substances, diminishes the labor of dressing and leaves the metalliferous contents in a concentrated form. Many ores of lead, zinc, copper and iron are prepared for heat treatment, or chemical processes, by the "coarse" method of concentration, but the ores of silver, gold and tin usually require more careful dressing and "fine" concentration.

When the chemical nature of the ore is known it is generally easy to arrange conditions which will assist in the reduction of the metal. It is thus the concentrates obtained from the mills are prepared for the further processes of roasting and smelting, or, if the precious metals are involved, chlorination, cyanidation and amalgamation.

The local facilities, the chemical susceptibilities of the concentrates, determine the smelting process most likely to be successful. In most melting operations the reduction is effected by the abstraction of oxygen from some oxidized compound of a metal, or, as it is technically termed, deoxidation. On the other hand, oxidation is frequently important in metallurgical processes, as it is a means by which substances that are readily oxidized may be separated from others which are less readily oxidized.

Many ores contain substances which generate volatile combinations under the influence of heat and air. This process is technically known as "roasting;" it removes volatile impurities and is generally preliminary to the fusion or smelting operations by which the reduction of the metals contained in the ores is accomplished.

Some ores and alloys are separated by the process of liquation, i. e., by taking advantage of the difference in fusibility of the components. For example, when an ore is exposed to a gentle heat sufficient only to melt the most fusible constituent of the mass, it is separated from the unmelted residue, or in the case of alloys, if the elements do not enter into chemical union, there is always a tendency for them to separate out according to their densities and in relation to their fusible properties.

The solvent action of certain liquids often-

times affords a convenient means of separating metals from the earthy matter enveloping them, consequently many of the ores are treated with acid or other liquids previous to the precipitation and reduction of the metals contained therein.

It would be a hard matter to go into the details of metal manufacture since the operations vary with the nature of the ores and the value of the metals which they contain. Prof. Roberts Austen, in his "Introduction to Metallurgy," has given a general summary of the methods of extracting and reducing metals from the ores, under the following heads, viz., 1. Liquation. 2. Distillation and Sublination. 3. By the reduction of metallic oxides at high temperatures (as $2\ Pb\ O + C = 2\ Pb + CO^2$). 4. By the decomposition of metallic sulphides by means of iron at a high temperature, as seen in the equation, $Pb\ S + Fe = Pb + Fe\ S$. 5. By cupellation, which is probably the oldest method of extracting metals from their ores. When lead is molten it oxidizes rapidly, forming litharge which has the property of dissolving other metallic oxides and combining with them into a slag. 6. By amalgamation, i. e., by taking advantage of the powerful solvent properties of mercury. 7. By electrolysis. 8. By crystallization, as in Pattison's method of extracting silver. 9. By the "wet" way—dissolving in acids and precipitating; or forming compounds which can be acted upon by suitable reagents. This by no means exhausts the list of methods by which metals may be extracted; there are many auxiliary processes and combination methods which could only be dealt with by describing the complete metallurgy of the metals.

This is especially true as regards the recovery of the "noble" metals. Metal refiners have such a wide range of methods to select from that it is sometimes a hard matter to decide which is the best treatment for a particular ore. The fact is, many good mines have failed to pay dividends because the economies of the extraction processes did not receive proper attention.

Whatever method of decomposing the mineral may be adopted—"wet" or "dry," all the labors of metallurgical processes are directed to the same end—to reduce the substance to the metallic condition and to separate impurities from the metals recovered. Every new reaction or change of the chemical relations of the material, contributing to its decomposition, may be turned to account for the recovery of the metal, or for the manufacture of some commercial product. Hence the increase in the number of metallurgic processes and the adoption of combination methods giving better control of the commercial values.

Perhaps the most prominent feature of modern metallurgy is the thoroughness with which the various elements contained in the ores, or in the resulting metals, are marshalled and utilized. In these days the methods of isolating and purifying the metals are better understood, the complex ores can be more fully treated, and the results regulated with more precision than ever before. There are few negligible quantities contained in the ores nowadays. The metallurgic methods are so comprehensive and the chemical reactions so well controlled that the real value of the various ores is not to be gauged by the proportions of the metals they contain. There is no doubt that the metal refining industry, or, to be precise, applied metallurgy, is undergoing a revolution. More is being taken out of the ores now than was possible a few years back; the quality of the metals produced is superior, the grades are more uniform and the cost of production is being steadily reduced.

To illustrate this point I quote this paragraph from a current newspaper: "Broken Hill ores, which hitherto have only been treated for the silver and lead content, are now to be worked for zinc and sulphur also." Thus, from the residue of an older metallurgical process, a new industry is to be created; and by the additional profit from zinc (16%), which was formerly ignored, and the manufacture of sulphuric acid, increased prosperity, in this instance, is assured.

Yet another example of remarkable development made in recent years is the smelting of concentrator slimes, which were practically refuse. By a simple process of sintering, or kiln roasting, and then smelting, thousands of tons are being converted into marketable metals —and profit!

As illustrating a modern process designed to economize the products of ores containing precious metals combined with volatile metals and elements, take Dr. Hoepfuerer's method of recovering zinc from argentiferous blends in which the percentage of iron is too large to permit the ordinary distillation method being used. "The ores are at first roasted with common salt, resulting in the producing of zinc chloride and sodium sulphate. These two soluble salts are then leached out, and the lat-

ter separated from the former by crystallization in the cold. The zinc chloride is then treated electrolytically, using carbon anodes and for cathodes a revolving plate of zinc. The chlorine as it escapes is absorbed by lime—making it a marketable product. The precious metals remain in the leached residues in the tanks." If rich enough these may be sent direct to the smelter; if not, they would require concentration.

This example is typical of the modern improvements and economies effected by studying the properties and capabilities of the associated minerals, ores, fluxes and fuels, and the obvious advantage of employing electricity for the reduction and separation of the metals.

To sum up: the modern methods of producing metals for the market are characterized by: 1st, the systematic observance of chemical principles; 2nd, the adoption of a large scale of laboratory methods; 3d, economy of power and material; and 4th, the introduction of electricity as a means of decomposing metallic compounds. Electro-technology has made enormous strides in the last decade. Electrolysis and the electric furnace have added many interesting products to the metal workers' store-house. The former has solved the problem of producing pure metals on a commercial basis, while the latter has rendered possible the reduction and union of many refractory metals which formerly were not feasible. The progress made in the manufacture of self-hardening steels since the adoption of the electric furnace for the commercial reduction of chromium, tungsten and other hardly feasible metals, affords a striking proof of the improvements effected.

But besides furnishing power for the engineer, heat for the metallurgist, attraction for the chemist, light for the world and "vitality for weak men"—as the electropathist puts it—electricity has many other uses awaiting development. Dr. Borchers says "there is no metal incapable of being reduced by electrically heated carbon," i. e., the electric arc. Electricity has long been known to be a potent factor in the decomposition of metallic substances, but metallurgists are only beginning to take advantage of the fact. Electro-conductivity has been proposed as a means of testing the purity of the metals; indeed, this has already been accomplished with copper and aluminum. So it is only a matter of time till a standard of conductivity is tabulated for all the metals in a state of purity. We shall then have established a cheap test of the purity of metals.

Other proposals connected with the electrolysis of dissolved or fused metals or metallic compounds are also meeting with practical application, but this is hardly the place for a statement of electro-chemical theories. Certain it is that electricity has proved an economical power in metallurgy. It can be made to subdue the elements to the last atom. It may be said to fulfil the functions of the elixir of life and the philosopher's stone in one act, and now that modern scientists have wedded the sparking Vesta to the strenuous Vulcan, we may expect a numerous and gifted offspring. A well-known London humorist deplores the abolition of London fog by means of electricity! He says: "Electricians must learn sooner or later that not everything which can be done by electricity ought to be done." Metallurgists must learn this too, and no doubt many of the old-fashioned metal refiners, who have not yet acquired the electric habit, will agree with the sentiment even if they fail to recognize the humor. The changes which have taken place in the general treatment of ores—even in the preliminary dressing and mechanical processes, would astonish the most informed refiner of a previous generation, for just as the introduction of the hot blast in the early days of iron and steel development created new conditions of working iron ores, so the later improvements in mechanical appliances and the newer applications of chemical and electrical principles have advanced and extended the operations and productions along the whole range of the metals.

CORE SANDS.*

BY J. S. ROBESON, CAMDEN, N. J.

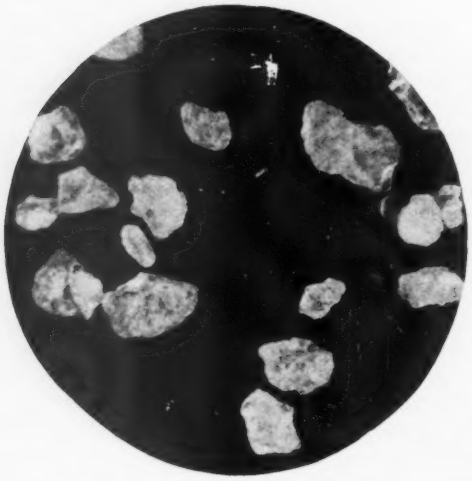
Though it is far from my intention to exploit by advertisement before and through you the company with which I am connected, still some reference to it must, perforce, be made if a proper understanding of the few facts I am able to present is to be had.

For this reason I want you to know that this company has been engaged in the manufacture of a core sand binder for the past 12 years and, as this product forms the bulk of its output, naturally, a great deal of time and money has been spent in studying the question of binders; whether these had best be solid or liquid; made of dextrine, flour, rosin or oil, etc., etc.

Some of the tests made in this investigation, and what I believe to be the results proved by

*Paper read at A. F. A. Convention, New York City, June, 1905.

them, have already been published. As, for instance, when I had the honor of reading a paper before the Foundrymen's Association of Pittsburg on Feb. 6 last, attention was drawn to the fact that a liquid binder gives more satisfactory and economical results than a dry binder and others, I hope to bring to the attention of the workers in the art of founding as they develop.



NO. 1. YELLOW SILICA SAND.

When this work was commenced almost the first problem for which an answer was requested was, why the different core sand binders or compounds acted differently in different foundries, or more pertinently and personally why was not our binder a success in each and every shop?

This failure in one place and success in another is a fact that is true of every material used as a core sand binder, whether it be a proprietary article or not.

It is more marked—or perhaps it is better to say, more noticed—with the proprietary articles than it is with the three most commonly used materials, flour, oil and rosin.

What is the reason for this difference?

Foundries use for molding and core making purposes sand and loam.

Sand may be defined as water-worn disintegrated rock without plasticity or adhesiveness.

Clay as the remains of disintegrated rock that is both plastic and adhesive.

Loam as a mixture of clay and sand.

As none of these three are ever met with in a pure state in nature, so the variations in composition are as great and uncountable as the sands of the sea.

It is almost within the bounds of the strict truth to say that every foundry uses its own particular sand or sand mixture for making cores.

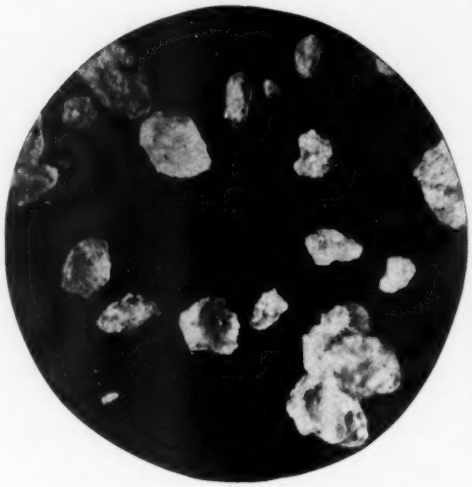
Now, while sand is sand, so is food food, and yet I take it that you will agree that there is a very great difference between the lunch you have but just now enjoyed and the usual mid-day meal of the owners of this island before it was discovered by Tammany and famed by Columbia.

Just as great is the difference in the sands of your individual foundries.

Sands vary in their chemical composition as to the amount of silica, alumina, iron, etc., that they contain and also as to the size of the grains.

This variation in the sand, not so much as to the actual size of the grains as to the relative amounts of each sized grain present and the amount and kind of clay has more to do with the very dissimilar results obtained in making cores than has the binder.

The photomicrographs and the table of sieved results give a better idea than can be conveyed in words of the variations as to the size and proportions of the grains.



NO. 2. DUNBAR SAND.

These photomicrographs are of sands that are commonly used in core making in different sections of the country.

It is almost unnecessary to state that, although the pictures are of individual sands, the usual practice is to make mixtures of the different kinds in order to obtain the proper result.

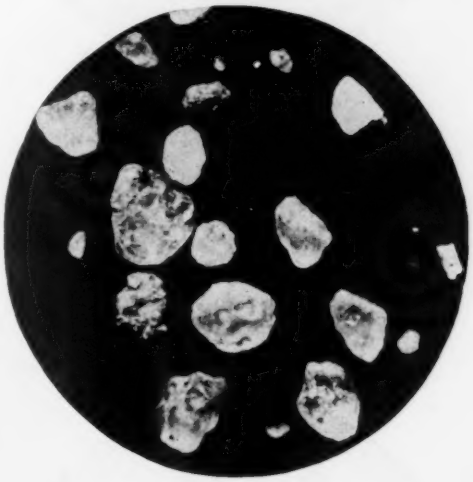
Each sample has been enlarged to about the

same extent, 1,600 times, so that some comparative idea may be had.

A very strong effort has been made to have the strength of these test cores comparatively equal. The same operator has made them, under the same conditions each time. They have been frequently checked and they are all made with one part of the same binder. Gluetrin, mixed with five parts of water to 50 parts of the sand. They are 7/8 in. round, made in a metal box, baked for the same length of time at the same temperature, supported on knife edges 8 in. apart for the breaking and the weight applied in the center.

In this connection it may be interesting to state that a core having a strength of one-half pound to the square inch is fully strong enough for any ordinary work.

1. Yellow Silica Sand: This makes the



NO. 3. ITHICA GLASS SAND.

strongest core of any that have been tested, giving 6.47 pounds per square inch.

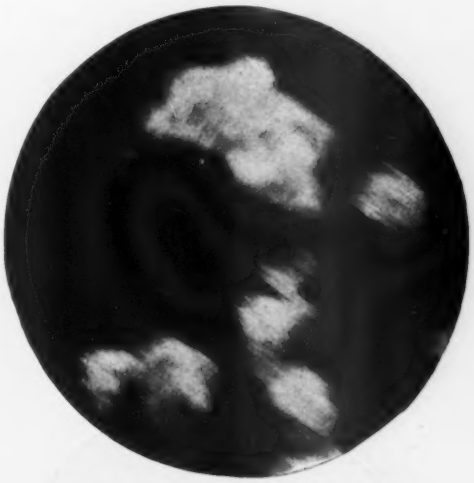
The proportions of the various sizes are such that the voids are well filled.

The clay is evidently also in about the proper amount, neither too much nor too little, for the one will weaken the core as well as the other.

A core made from the sand, washed free from clay, had a strength of only 0.27 pounds per square inch.

No. 2. Dunbar Silica Sand: This has a strength of 6.18 pounds per square inch, almost equaling No. 1 and, in the main, the proportions of the various sizes are about the same, but in this the percentage of the larger sizes is greater.

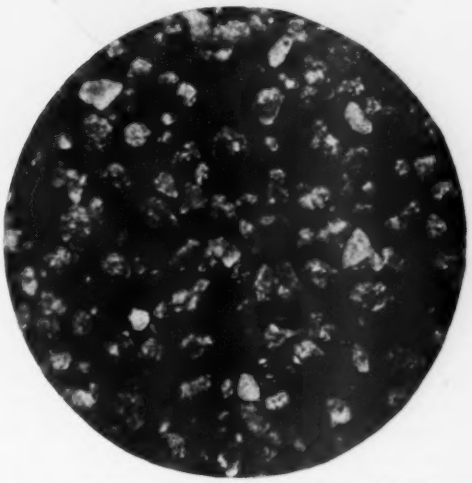
No. 3. Ithaca Glass Sand: This gives a strength of only 2.19 pounds per square inch. The proportions of the various sizes are different from No. 1 and No. 2 and there is less clay present.



NO. 5. BURLINGTON ISLAND SAND.

No. 4. Welsh Mountain Crushed Rock: This gives a strength of 2.05 pounds per square inch, practically the same as No. 3. This is, however, a very different sand, inasmuch as it is made by crushing a pure silica rock. This contains no clay and any binding qualities that it has in a core come from the proportions of the size of the grains and the binder.

No. 5. Burlington Island: This gives a



NO. 7. FINE MOLDING SAND FROM PITTSBURG.

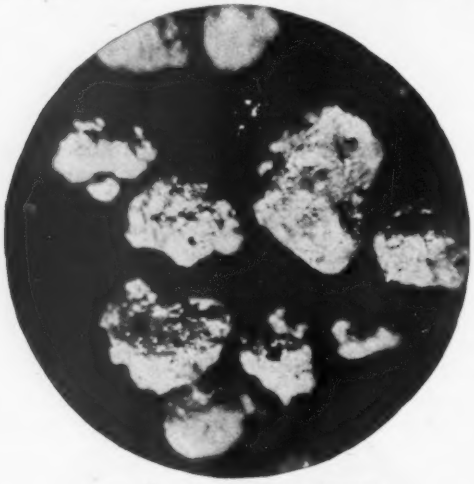
strength of 2 pounds per square inch and it will be at once noticed that there are only three sized grains in this sand and that two of them are practically equal in amount. The binding

quality of this sand comes largely from the clay contained in it. This clay or loam is attached to and surrounds the grains of quartz in a different way than from any other of the loamy sands here shown.

No. 6. Jersey Glass Sand: This gives a strength of 1.98 pounds per square inch and here we find practically only two sizes of grains and but little loam.

No. 7. Fine Molding Sand From Pittsburg: This gives a strength of 1.95 pounds per square inch, practically the same as No. 4, No. 5 and No. 6 and in this case there are again practically only two sizes of grains, but it will be noticed that the smallest size is present in a very much larger amount than in the sands just preceding.

No. 8. Allegheny Loam: This gives a strength of 1.83 pounds per square inch and



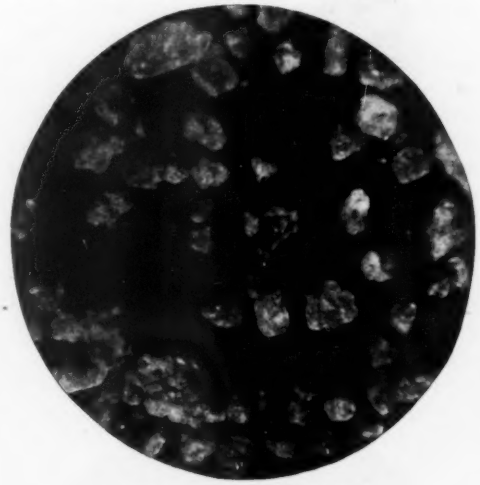
NO. 8. ALLEGHENY LOAM.

here there are four different sizes of grains. The loam in this sand is of a very adhesive character, but there is too large a quantity present. If this sand is mixed with a sand that is free from loam, the core resulting from the combination shows a much greater strength.

No. 9 and No. 10. Latta Brook No. 1 and No. 2: These sands are from the same locality, have practically the same strength—1.68 and 1.65 pounds per square inch, but contain very different proportions of the various sized grains. No. 9 contains more loam than No. 10.

No. 11. Tullytown Sand: This gives a strength of 1.58 pounds per square inch and contains a considerable amount of loam, as well as a large percentage of the smallest sized grains.

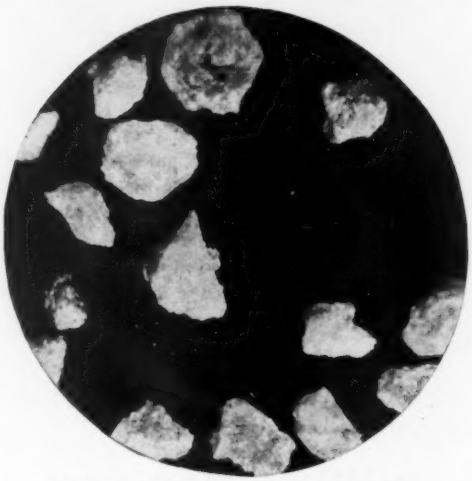
No. 12. Albany Sand: This gives a strength of 1.46 pounds per square inch and it will be at once noticed that there is a large percentage of one size, the smallest, grain present.



NO. 12. ALBANY SAND.

No. 13. Ganister Rock: This gives a strength of 1.46 pounds per square inch and is a crushed silica rock, almost the same in chemical composition as No. 4. The proportions of the various sized grains are different, however, from No. 4, which accounts for its comparative weakness.

No. 14. Old Foundry Sand: This gives a strength of 1.25 pounds to the square inch. It is shown here more as a matter of curiosity



NO. 13. CRUSHED GANISTER ROCK.

than for any other reason, since this sand varies in every shop.

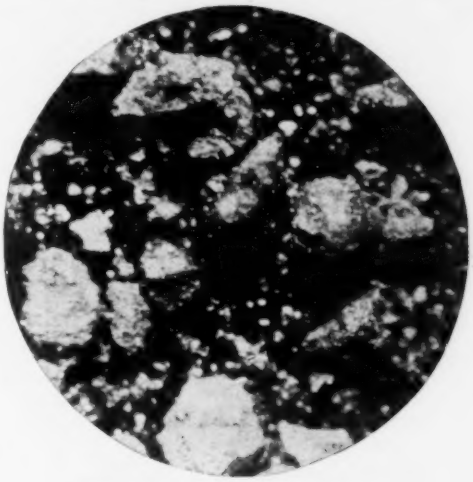
No. 15. Pittsburg River Sand: This gives a strength of 1.12 pounds to the square inch.

This sand contains practically no loam; its strength is entirely due to the proportion of the various sized grains.

No. 16. Millville Gravel: This gives a strength of 1.09 pounds to the square inch and contains a very large amount of loam. The different sized grains are badly proportioned and the strength is largely due to the adhesive character of the loam.

No. 17. Providence Fine Core Sand: This gives a strength of 0.9 pounds per square inch and is a typical bank sand of New England. It contains a considerable amount of clay and it will be noticed that the greatest amount of the grains are in the smallest class.

No. 18. Sodus Point: This gives a strength of 0.87 pounds per square inch and contains little or no clay. Such strength as it has is



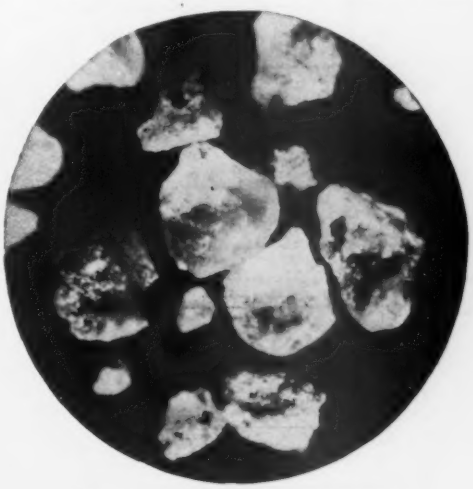
NO. 14. OLD FOUNDRY SAND.

obtained largely from the fact that the bulk of it is composed of about equal proportions of the two smallest sizes, so that the voids are fairly well filled.

No. 19. Pittsburg Bank Sand: This gives a strength of 0.75 pounds to the square inch. This sand contains a great deal of loam and would evidently have a greater strength if there was a larger percentage of the finer sizes present.

No. 20. Lumberton Sand: This gives a strength of 0.71 pounds to the square inch and contains a large amount of loam. This sand has about the same strength of No. 19, but it will be noticed that it has a larger percentage of the smallest sized grains, and it might, therefore, be supposed that it would be stronger. The grains, however, in this sand are all rounded, whilst those of No. 19 are decidedly angular. This comparison as to the shape of the grains also applies to No. 16.

No. 21. Pennbryn White Silica: This gives a strength of 0.56 pounds to the square inch

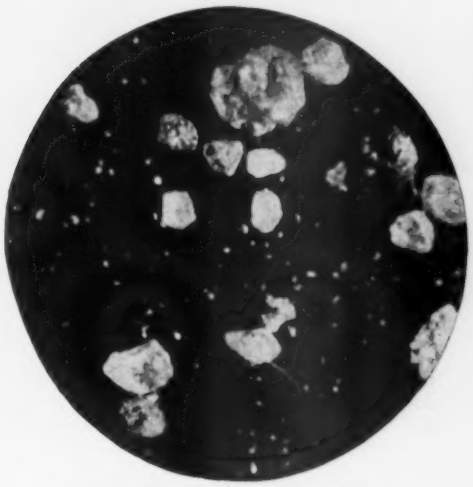


NO. 15. PITTSBURG RIVER SAND.

and contains practically no clay or loam, it being a washed sand. The proportions of the three sized grains present are bad, which accounts for its comparative weakness.

No. 22. Rockaway Beach: This gives the same strength per square inch as No. 21 and the same remarks are true concerning it.

No. 23. Scranton Sand: This gives a strength of 0.56 pounds to the square inch. It



NO. 16. MILLVILLE GRAVEL.

contains little loam or clay and would be a very much stronger sand were it not for the fact that the proportion of large sized grains is too great.

SIEVE ANALYSIS OF SANDS AND TENSILE STRENGTH OF CORES MADE WITH GLUETRIN.

No. of Sieves used		# 1 Yellow Silica	# 2 Dunbar	# 3 Ithaca Glass	# 4 Welsh Mt. Crushed Rock	# 5 Burlington Island	# 6 New Jersey Glass	# 7 Fine Moulding Sand Pittsburg	# 8 Allegheny Loam	# 9 Latta Brook #1	# 10 Latta Brook #2	# 11 Tully Town	# 12 Albany	# 13 Crushed Gantster Rock	# 14 Old Foundry	# 15 Pittsburg River	# 16 Millville Gravel	# 17 Providence Fine Core Sand	# 18 Sodus Point	# 19 Pittsburg Bank	# 20 Lumberton	# 21 Penn-bryon White Silica	# 22 Rockaway Beach	# 23 Scranton
# 2, # 4,		0.00 %	1.10 %	0.4 %	0.7 %	0.00 %	0.00 %	0.00 %	15.8 %	0.40 %	0.00 %	0.6 %	0.00 %	14.5 %	0.1 %	17.4 %	25.5 %	0.00 %	0.00 %	0.00 %	0.3 %	0.00 %	0.00 %	0.00 %
# 8, # 16, # 30		6.9 %	5.9 %	23.4 %	14.3 %	9.3 %	0.10 %	0.00 %	57.3 %	41.5 %	1.5 %	5.7 %	1.0 %	46.5 %	45.3 %	44.3 %	60.6 %	1.8 %	0.3 %	61.1 %	28.4 %	4.9 %	14.1 %	18.4 %
# 40, # 60, # 80		71.8 %	79.7 %	58.8 %	61.4 %	45.7 %	55.5 %	14.2 %	23.7 %	49.9 %	82.8 %	33.9 %	15.7 %	17.1 %	46.3 %	36.6 %	12.1 %	9.0 %	45.0 %	36.2 %	48.5 %	68.1 %	81.6 %	69.9 %
# 100, # 150, # 200		21.3 %	13.3 %	17.4 %	23.6 %	45.0 %	44.4 %	85.8 %	8.2 %	8.2 %	15.7 %	59.8 %	83.3 %	21.9 %	8.3 %	1.7 %	1.8 %	89.2 %	54.7 %	2.7 %	22.8 %	27.0 %	4.3 %	5.1 %
Tensile Strength in pounds per inch		6.47	6.18	2.19	2.02	2.00	1.98	1.95	1.83	1.68	1.65	1.58	1.46	1.46	1.25	1.12	1.09	0.90	0.87	0.75	0.71	0.56	0.56	0.56

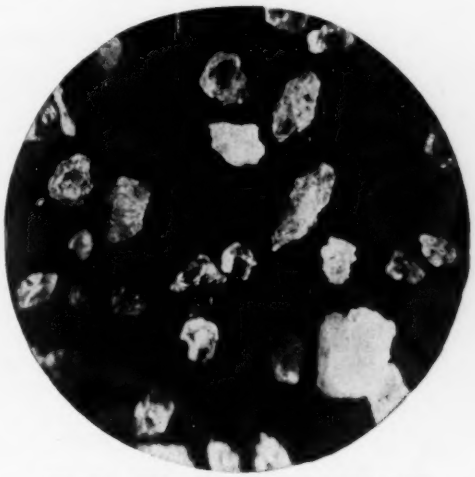
Largest diameter of grains passing through Sieves in fractions of an inch.

# 2 — 0.435"	# 16 — 0.0117"	# 60 — 0.000916"	# 150 — 0.003"
# 4 — 0.201"	# 30 — 0.0835"	# 80 — 0.00075"	# 200 — 0.002"
# 8 — 0.0925"	# 40 — 0.0.0173"	# 100 — 0.0025"	

The Foundry

In the table is shown the amounts, graphically and in percentages, of the different sized grains in each of these twenty-three sands.

From the figures as to strength given in the table it is evident that any single one of these sands will make a core that is strong enough to do the work.



NO. 17. PROVIDENCE FINE CORE SAND.

There are, however, other points to be considered besides mere strength in a core.

Following the requirements as set down for a good binder in the Pittsburg article of Feb. 6, 1905, a good core

No. 1.—Must be strong both green and dry.

No. 2.—Must be weak and rotten after the casting is cooled.

No. 3.—Must not be easily affected by moisture.

No. 4.—Must give off but little gas.

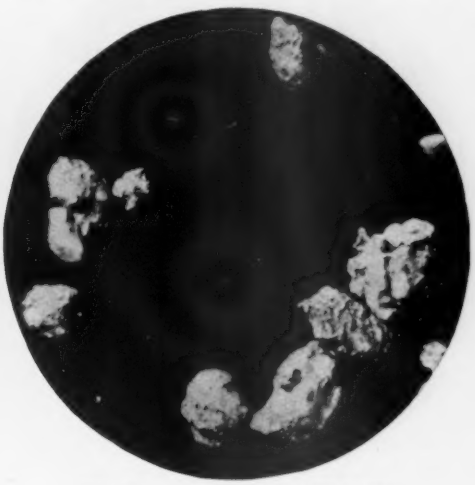
No. 5.—Must dry quickly.

No. 6.—Must not change in size.

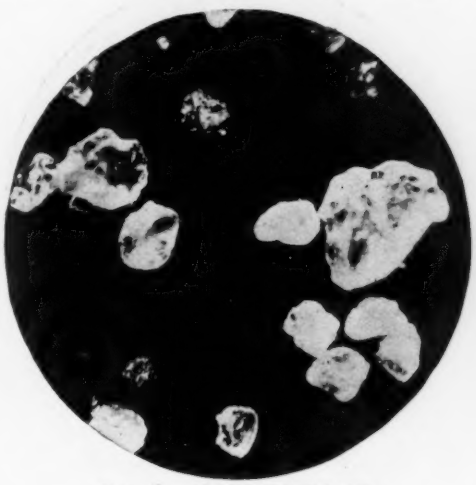
No. 7—Must have a low cost.

Now cores made of a single sand, in most cases, will not give the best results under all of these heads.

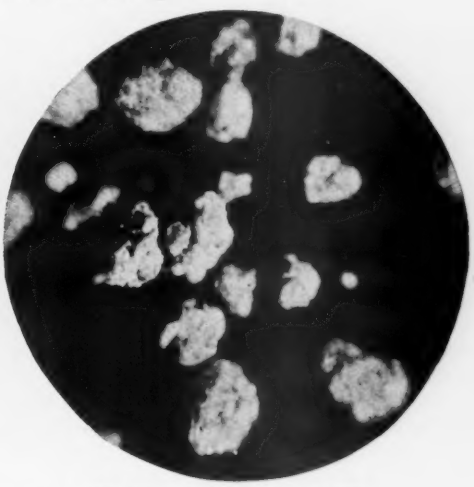
If, for instance, a sand is too low in clay a larger amount of the binder must be used to give the necessary strength and this, perhaps, will be too great a quantity to burn out during the pouring of the metal so that the core will not be weak but hard and difficult to remove from the casting.



NO. 19. PITTSBURG BANK SAND.



NO. 18. SODUS POINT SAND.



NO. 20. LUMBERTON SAND.

Likewise the binder in such a core will cost entirely too much per ton of sand mixed.

In such a case a mixture of sand must be made so as to add loam or clay and the amount of binder reduced.

On the other hand, if the sand contains too much clay, only a small amount of binder will be required, but the core may be like a brick and so dense and compact as to blow.

In such a case add a sand containing less clay and increase the amount of binder.

NO. 21. PENNBRYN WHITE SILICA SAND.

This sounds, in a way, as very simple, but when you recollect that the size and proportions of the various sized grains have much to do with the question, as well as the clay, it is no wonder that the coremaker is often puzzled over his sand mixtures or dislikes to change them once they be established to his satisfaction.

As the binders act in a different way, there is here another variable brought into the story.

Flour swells and pushes its way between the grains, but does not move from the place where it was left in the mass by the mixing and ramming.

Rosin, under the influence of the heat of the core oven, melts and runs somewhat through the mass, though a large part of the original grain remains in the last position of rest.

Oil and gluetrin, because they are liquid, spread more evenly throughout the mass and over each grain during the mixing than do the solids, and when the heat is applied thin and spread still further.

Thus the sand mixture may often have to be changed when the binder is changed if the best results are to be obtained.

As an example of this, the following mixture worked fairly well, though with occasional trouble from blowing:

2 parts loamy sand
1 part sharp sand
Flour, 1.15.

Gluetrin at 1-50 was tried as a substitute for the flour, mainly because it was claimed that it would not blow. The cores did, however, both blow and scab.

The sand mixture was changed and successful results are now obtained from this:

1 part loamy sand.
1 part sharp sand.

Gluetrin mixed with 2 parts of water, at 1-70.

This likewise reduced the cost of the binder per ton very considerably.

In another case, a foundry making small cores used the following:

5 buckets burnt cores.
42 " gangway sand or sweepings.
8 " coarse sharp sand.
10 " fine Albany sand.
½ " Gluetrin, mixed in 5 buckets water.

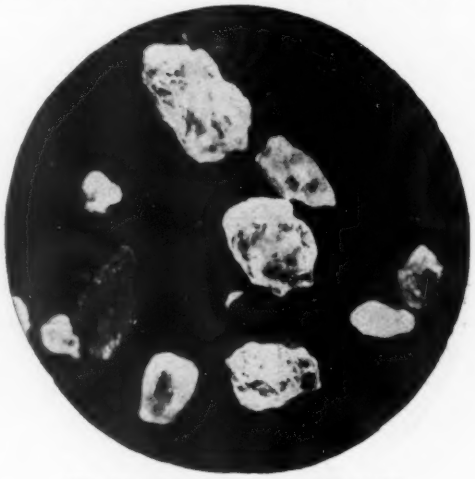
This is 1 part of binder to 30 parts of sand and they claimed that the cores were difficult to clean from the castings.

It was suggested that they try the following mixture:

5 buckets burnt cores.
52 " gangway sand or sweepings.
8 " coarse sharp sand.
½ " Gluetrin, mixed with 5 buckets water.

With this they had uniformly successful results.

The trouble had been laid at the door of the binder and if they had not been willing to make this change in their sands another would



NO. 22. ROCKAWAY BEACH SAND.

have been added to the already long column of mysterious failures.

The binder would have once more been blamed for the fault of the sand and an opportunity to save money both on the sand and the binder lost.

USE OF THERMIT.

In your edition of The Foundry for April I notice a communication from Mr. Patrick Redington on mending castings with Thermit. This article is very clear in its descriptions, and shows that the writer has a very good and quite a broad understanding of the use of Thermit, and practically illustrates what can be done in shop practice with so convenient a help as Thermit has proved itself to be.

I would emphasize particularly what Mr. Redington says describing how the mold boxes were made. This information would prove of great assistance to others in performing similar work, and while he has not followed entirely the instructions given by the Thermit people, it shows that one can (with a fertile mind and ingenuity similar to Mr. Redington's) get results in ways, possibly, even better than those described by the promoters of Thermit. Of course it will be understood that it is difficult in any work to lay down cast iron rules to fit any mode or method of procedure in any art; as you find different minds so you will find different methods of accomplishing certain results.

There is no doubt in my mind that the Thermit people have provided a very comprehensive set of rules to work from, and as has been developed in my experience, by following closely their instructions—although deviations may be necessary with some of the details—the results may be accomplished through following out the instructions they have given.

In the reference made by Mr. Redington to the quantity of Thermit required for a given operation, again I would state that the rules laid down by the Thermit people unquestionably are provisional, and the engineer should use his judgment largely as to the conditions, the size, and the character of the repair to be made. In my experience I have found that small jobs require a larger quantity proportionately than the larger jobs, as the "Thermit energy," wasted in radiation in the molds, the articles to be repaired, etc., is greater proportionately in the small jobs than in the larger jobs.

The reference Mr. Redington makes to the use of wood in preparing the mold boxes also shows that it is not absolutely necessary to follow the instructions laid down by the Thermit people, but the writer will state that this method cannot be followed in all cases, but in such large welds it is possible where the work can be performed on a shop floor, and there is not much handling necessary, that the mold boxes could be made of wood, as described. In usual practice, where the Thermit has to be taken to the work,—in other words, where the job cannot be taken to the forge or foundry,—considerable handling of the mold boxes is necessary, and in such cases it is essential to have the mold boxes lined and thoroughly dried, in which case the wooden boxes would not stand the heat necessary to dry them. One of the essential features in all repair jobs with Thermit is that not only the work to be prepared, but also the mold boxes should be prepared by being heated to as high a temperature as it would be possible to obtain, even heating the parts to be repaired to a red heat, (if it is possible).

It is peculiar to relate that I had arrived at the same conclusions that Mr. Redington had as regards welding cast iron, and I used the factor of three as he states, but I believe that even better results can be obtained by still further increasing the quantity, and that a factor of four will ensure a better weld than with the smaller quantity.

For the benefit of your readers I would say that I have experienced the same results from experimental welding as described by Mr. Redington, wherein he bares a portion of his cast iron core to the Thermit, and also suggesting a wrought iron rod. The wrought iron being clean and free from scale welds at a lower temperature than cast iron, which had in Mr. Redington's case, I assume, a surface scale, and the scale which forms on the outside of cast iron requiring a greater heat to displace than that which is on wrought iron. Could this scale be removed before a cast iron weld is attempted a smaller amount of Thermit may be used.

I would say that Mr. Redington's reference to the value of Thermit in the foundry is logical. In no instances where castings are small or easily obtainable would it pay to use any repair methods. No one would use a repair method when a new casting can be gotten for possibly an equal cost. The use of any repair methods obtains in cases where a casting is large, costly, and difficult to procure, and even in many cases where the castings are small they may be repaired for less money than the cost of new ones where machine work is a consideration. I do not believe that anyone would consider the acceptance of a repaired casting, whether repaired by Thermit or any other method, where

it is part of any new machine. I think this portion of the article is out of the question.

Thermit has many uses which we are learning daily, and it will be interesting to readers of The Foundry to learn of any new uses that it may be put to, and I trust that experimenters in this line will not be backward in bringing its uses to the front. One very valuable service Thermit can perform in foundry practice is to place it in the risers in intricate castings, where it may be put into operation, and where it will regenerate the metal that is being used, permitting a better flow of the metal, promoting circulation and producing as a result castings freer of blow holes.

I must compliment Mr. Redington upon his article, and commend it to your readers, and would say that it clearly demonstrates how readily the use of Thermit can be grasped, and while it has only been on the market such a short time, it is quite interesting to note the progress it has made in the field of mechanical arts.

H. L. DESANGES.

PRIDMORE MOLDING MACHINE WITH BRODIN ATTACHMENT.

A MOLDING MACHINE PATENT.

John A. Brodin, of Chicago, has patented a device which is here illustrated as applied to a Pridmore molding machine. Fig. 1 is a plan view of the molding machine with the pattern in place. Fig. 2 is an inverted plan view of the pattern carrier and the pattern. Fig. 3 is a vertical section on the line a-a of Fig. 1. Fig. 4 is a vertical section on the same line with the parts in another position, showing the pattern ready to be lowered after the mold has been made. Fig. 5 depicts the apparatus mounted on a Pridmore machine. Identical letters signify like parts on each of the line drawings.

The stripping plate carrying the flask is secured to it by the pin A at one side. This projects upward from the stripping plate and passes through a hole in the rim of the flask. At the other side the parts are held by the pin B extending through another lug. A rectangular frame C is braced underneath by horizontal arms and carries the pattern, the combination resting on a vertical support moving freely in the main frame of the machine to allow the pattern to be raised and lowered through openings in the stripping plate. The pattern is secured to the carrier C by bolts and has two movable hook-shaped parts D

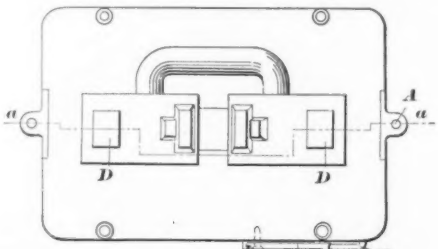


Fig. 1

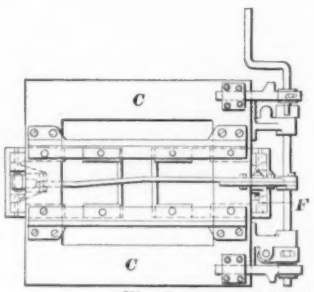


Fig. 2 THE IRON TRADE REVIEW

PLAN VIEWS OF PATTERN AND PATTERN CARRIER.

turned in opposite directions. The latter gives the desired contour to the mold at these places. The projecting parts D are suitably linked to a bent bar E having a hub at the center embracing the shaft F to which it is firmly secured. The shaft F has stop lugs adjusted with set screws to limit the rotary movement in either direction. The shaft also has a crank and handle. Upon the crank rests the grooved end of the latch G.

This form of the machine is particularly adapted for making the upper portion of molds for casting interlocking brakeshoes, and especially the peculiar opening in the mold for forming the hooks on the castings. In the

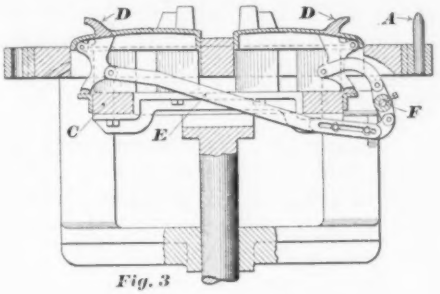


Fig. 3

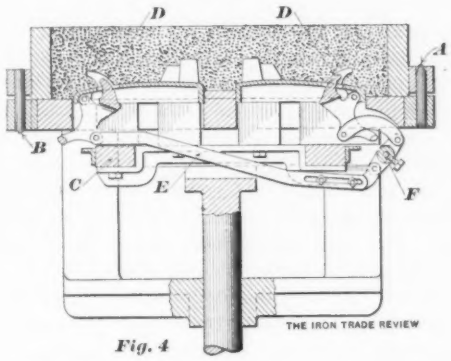


Fig. 4

SECTIONAL VIEWS OF MOLDING MACHINE.

case illustrated the device will obviate the necessity of coring, a part of the pattern being first withdrawn, then the pattern as a whole is freely separated from the mold.

The projecting parts D are first set by turning the crank handle until the convex faces of the links rest in the angle irons, the rotation of the main shaft being arrested at this instant by one of the stop lugs contacting with its setscrew. The latch G, the grooved end following the crank, prevents the projecting parts D from being forced back by the impact of the sand in the process of making the mold. When this process is completed, the latch G is lifted and the hand crank turned in the opposite direction, withdrawing the hooks D far enough to allow the pattern to be lowered without injury to the mold. The backward turn is arrested at the proper point by the contact of the other stop lug with its setscrew.

GENERAL INDUSTRIAL NOTES.

The Pittsburg Railway Supply Co., of Pittsburg, Pa., has been incorporated to manufacture journals, journal boxes, and other railroad supplies.

The new soft iron foundry of the Pennsylvania Railroad Co., at S. Altoona, Pa., is now in operation. H. H. Stone is foreman and Philip McGarvey assistant foreman.

The stockholders of the Sharon Foundry Co., of Sharon, Pa., have voted to increase the indebtedness of the company $100,000. The money is to be used in building an open-hearth steel plant in connection with the steel casting department.

W. W. Lindsay & Co., Philadelphia, Pa., have opened a new warehouse at 2231 Wood street, which will be devoted exclusively to the carrying of a large stock of chaplets.

The Birdsboro Steel & Foundry Co., Birdsboro, Pa., has opened an office at 718 Real Estate building, Philadelphia, and placed J. W. Warfel in charge. Mr. Warfel has been the company's Eastern representative for several years.

The National Cast Steel Co., Allegheny, Pa., has been incorporated to deal in steel, iron and other metals. The capital stock is $300,000.

The S. Obermayer Co., manufacturer of Foundry Facings and Supplies, of Cincinnati, Chicago and Pittsburg, announces that it has opened an office at 120 Liberty street, New York. Mr. Edgar Seaman, who has represented the company at Pittsburg for some years, has charge of the New York office.

The Dornfeld-Kunert Co., of Watertown, Wis., has been incorporated to carry on an iron and brass foundry business. The incorporators are Daniel H. Kiese and Chas. Kunert.

The Columbia Heights Foundry Co., of Minneapolis, Minn., has been incorporated with a capital of $50,000. The officers are Henry H. Orme, president; James E. Orme, vice-president, and Francis W. Orme, secretary and treasurer.

METALS IN FOUNDRY PRACTICE

Devoted to inquiries from Practical Foundrymen on subjects relating to the Melting and Using of Cast Iron, Steel, Brass and Bronze.

The following experts answer questions in this department:

W. J. Keep, Cast Iron.

J. B. Nau, Metallurgy of Steel and Steel Castings.

Dr. Richard Moldenke, Malleable Castings.

C. Vickers, Brass Castings.

We have also made arrangements with several others to act as special contributors upon Brass, Bronze and other subjects. All inquiries should be addressed to the Editor of THE FOUNDRY, and they will then be forwarded to those in charge of the different subjects.

CAST IRON NOTES.

BY W. J. KEEP.

BUOYANCY OF CAST IRON.

For the last six months quite an interesting discussion of this subject has appeared in the columns of the *Ironmonger*.

Every founder who has noticed has seen, when he threw a piece of cold cast iron into a ladle of liquid iron, that the solid iron sank out of sight because each degree of heat that the liquid iron has absorbed has increased its bulk. For equal bulks the cold iron is heavier and sinks.

In a moment or two the iron, still solid but white hot, rises and floats on the surface which is proof that it has expanded more than the melted iron and is lighter.

The piece is rapidly becoming smaller and sinks to the surface as the last portion melts showing that just at melting it is not as light as when it floated higher on the surafce.

We find that white iron does not float and that gray iron floats more above the surface as its silicon increases. Let us examine a reversal of this process.

When a mold is filled with fluid cast iron a very thin skin forms next to the surface of the mold. Other particles cling to its inner surface, but the shell is still pliable. As the fluid metal in this shell loses heat it decreases in volume and sinks at the gates and often as the metal settles away from the upper surface of the mold the pliable skin follows it and leaves a sink hole in the casting, while other parts being more rigid retain the form of the mold. The additions of grains on the inside of this shell finally stiffens it so that it can retain its shape. The fluid metal in the interior continues to decrease in bulk and to form on the inner surface of the shell and finally leaves at the center a porous spongy spot if the molder does not feed fresh fluid metal to fill the cavities. The cooling mass has been shrinking constantly. There has never been any moment of solidification because this has taken place particle by particle and there has been no expansion that could help force the metal into the sharp configuration of the mold. The sharp casting is caused by the fluidity and the weight of the liquid metal.

The shrinking external and internal continues with the loss of heat until the casting is cold.

In 1895 I was able to measure these changes and discovered the following facts: The carbon in the iron remained in the combined state until the casting had become perfectly solid and was at a red heat, and there a complete change in the crystallization took place and the carbon was changed into graphite which was deposited between the crystals already formed.

This change of crystallization caused an expansion more or less great. In very graphitic iron with high silicon the expansion increased the bulk of the mass so that it was larger than the original mold. This expansion is permanent.

The shrinkage of the iron on account of cooling less the swell from the change of crystallization, equals the final shrinkage of the iron. As the shrinkage from loss of heat is probably the same for all irons, the amount of final shrinkage depends upon the amount of expansion and this depends upon the percentages of silicon and carbon.

Remember that this expansion takes place after the metal is solid. In a test bar cooled in the mold the greatest expansion is reached in a test bar 1 in. square in about 15 minutes after the mold is filled, but in a test bar 4 in. square it does not stop expanding for 1½ hours, and for this reason the final shrinkage of a large casting is less than that of a smaller casting.

SPONGY SPOTS IN THIN CASTINGS.

Several small parts of a casting have been sent to me that are about 3-16 inch thick. The surface appears perfect but when the polishing wheel cuts away the surface one or more small ragged shrink holes appear about 1-16 in. in diameter which reach too near the opposite surface and therefore cannot be cut out with the polishing wheel. The softer the iron the worse the holes. Therefore the molder says that it is dirty iron.

The castings sent me have one spot a trifle thicker than the rest and the shrunk hole occurs in the thickest part. The thickening was probably done to strengthen the portions of the casting which seems to have served the purpose of legs to a lamp base.

By making the pattern uniformly ⅛ in. thick and strengthening it by a narrow rib would remove the shrink spots.

It is a fact with iron containing towards 3.00 percent silicon, such as is used for such light castings with a smooth and clean face, that the thinner the casting the softer and the more dense the grain, while portions that are thicker have a surface so hard that sometimes the polishing wheel cannot be made to cut.

The reason for these hard surfaces in thickened castings has never been explained. A pickle of hydrofluoric acid will soften such a surface indicating that the high silicon has something to do with the hardness.

MALLEABLE CAST IRON NOTES.

BY DR. RICHARD MOLDENKE.

MALLEABLE MIXTURES.

Your reader asks the process by which malleable iron is made, or if the mixture required in making is a secret and not to be obtained. Presumably the inquirer is a foundryman who knows that malleable iron can be made in the cupola, and that it must be annealed before being fit to use. The first part of the rather general inquiry can be answered thus: Good malleable castings can be made in the cupola, but better ones in the air furnace, or open-hearth. All malleable castings must be properly annealed, and the furnace iron anneals better than that made in the cupola.

As to the mixture question. This will always be a mysterious thing to the man not familiar with the properties of malleable cast iron, and he who does not fully understand the nature of the business, would do well to either loaf around a malleable shop for a year or so, if they will let him, or else stay out and save his money.

Where, however, a man knows what he will run up against, the mere question of the mixture is an exceedingly simple one. It is only a question of analysis, and the buying of properly made pig irons. Thus for the latter only the regularly made "Bessemer Malleables" are to be used, and not any old iron with the given composition. Of coarse, charcoal irons are the best to use, but the work obtained by competition will not usually allow this except in the territory about the charcoal furnaces.

The mixture is made up of pig iron, one-half in amount or a little less. Then the sprues of the previous heats, and finally additions of malleable scrap and steel scrap. The composition of the charge will be about as follows: Silicon 0.80 to 1.30, depending upon the weight of the castings, the thick ones with the lower silicon, the very thin ones with the upper limit. Sulphur not over 0.05; Manganese preferably not over 0.40; Phosphorus not over 0.200.

In general the specifications for pig iron for malleable castings purposes, where good work is wanted should be as follows: Silicon 0.75 to 1.50, the particular point wanted to be specified exactly, thus silicon 1.30, which should allow the iron to come 1.20 to 1.40 only. Sulphur should be specified 0.04 and under, though 0.05 may be accepted, if one can do no better. Manganese should not be taken over 0.60, unless other irons running very low in this element are mixed in to cut down the average in the mixture below 0.60 in the pig iron part, and 0.40 in the pig iron plus sprues. Phosphorus is best specified as not over 0.200, though for charcoal irons 0.225 is admissible.

The percentage of steel allowed into the mixture is small, as otherwise excessive shrinkage results. Thus about 1,000 lbs. in a 20,000 lb. charge is enough, especially when say 3,000 lbs. of this consists of malleable scrap.

A typical mixture for malleable castings would be as follows:

Mabel (silicon, 1.00)	4,000 lbs.
Briar Hill (silicon, 1.50)	2,000 lbs.
Hinckle (silicon, 0.50)	1,000 lbs.
Ella (silicon, 1.25)	3,000 lbs.
Sprues (silicon, 0.65)	6,500 lbs.
Malleable scrap, 0.40	2,500 lbs.
Steel scrap, 0.00	1,000 lbs.

The Alabama Great Southern Railway has taken charge of the old Southern Car & Foundry Works at Gadsden, Ala., and has commenced the work of repairing and rebuilding the plant, and hopes to have it in operation early in August.

The wheel foundry plant of the American Car & Foundry Co., at St. Charles, Mo., has resumed operations after a period of idleness, during which a number of improvements have been made.

BRASS FOUNDRY NOTES.

BY C. VICKERS.

SOFT METAL.

Question—Will you please give me the composition of a soft metal for casting ornaments, small figures, plaques, medallions, etc. One that will not shrink too much?

Answer—No. 1—Tin, 25 lbs.; antimony, 3 lbs.; copper, 1½ lbs.

No. 2—Tin, 50 lbs.; lead, 30 lbs.; antimony, 10 lbs.

No. 3—Lead, 25 lbs.; antimony, 3 lbs.; tin, 2 lbs.

No. 4—Zinc, 80 lbs.; copper, 10 lbs.; aluminum, 3 lbs.

USING FILINGS.

Inquiry—We have a considerable amount of bronze and brass filings which when swept up contain some iron filings and some sand. We wish a flux that when the filings are melted will cause the iron and other impurities to rise to the surface so that they may be skimmed off before pouring the metal into the ingots. Can you please tell us of a flux which should be used for this purpose?

Answer—The filings must be cleaned before melting. Magnetic machines can be obtained that will remove all iron, or hand magnets may be used. No flux is at present known that will do what this inquirer wishes.

C. VICKERS.

BRONZE PINIONS.

Question:—I am having trouble with bronze pinions for street cars. These pinions are 5 in. in diameter, 4½ in. face, 14 teeth, and weigh 20 lb. They are used to run against a steel wheel. When the motorman turns on the current too suddenly, one or two teeth generally break out. I make these pinions of the following alloy:

Copper	90 parts
Tin	9 "
Zinc	4 "

I also add one stick of phosphorus to each crucible of metal. No ingot copper is used as the company furnishes plenty of scrap copper wire. Can you please state what the trouble is and if there is a better alloy? If so, please give it.

Answer:—Make the alloy tougher by decreasing the tin or try some of the manganese alloys published in this column.

Bronze gears for this purpose are obsolete rolled steel having superseded it.

SHOT IRON.

Question:—On page 177 of the June issue of The Foundry in the article on "Shot Iron," mention is made that the first six days of running the mill (Sly Mill) showed the following weights of good, clean shot iron: First day, 1,570 lb., etc. It does not appear whether or not this was recovered from the daily drop of the cupola, or whether the mill used the daily drop and in addition some material from the foundry dump in order to keep the Sly Mill running the full number of hours mentioned in the article. If the latter were the case, it would be interesting to know how much of the iron was recovered from the daily drop of the cupola and how much from the cinders on the dump.

A READER.

Answer:—Turning to my records on the cinder mill, I find that the amounts credited for the first six days running of the mill are the amounts recovered from the daily drop. For the first ten days, the mill was run entirely on the daily drop. Then we conceived the idea of working over the dump, but found it would take too long to do it by simply using the spare time of the working mill. Hence, a second mill with an electric motor to drive it, was placed on the dump.

We had some difficulty when we first started the Sly Mill, caused by the tendency of the man in charge to fill it too full, thus making it work slow and waste iron. Also we did not have sufficient water supply. We also had the mill running somewhat too fast at the beginning to obtain the best results. At present we would not be without it for anything.

W. P. WOODEN.

CEMENT FOR SIDEWALK GLASS.

Inquiry—Can you give me a good recipe for a good cement for fastening glass into the cast iron frames used for side walk lights?

Answer—One firm doing a large amount of work along this line uses the following mixture for it: One-half gallon of gas tar and six gallons of melted sulphur.

HOT CRACKS IN STEEL CASTINGS.

By Arthur Simonson.

An attempt will be made in the following article to outline the principal causes of one of the greatest difficulties that a steel founder has to contend with, and to suggest some means by which it may be overcome, at least partially. Cracks in

steel castings are of two kinds, which differ in their appearance and cause very materially. Hot cracks take place at the time of solidification of the metal or very soon after; cold cracks are formed while the metal is below red heat. The former take the appearance of a tear, are very ragged and there is a sinking of the metal at the edges; they are generally quite wide and have a film of blue or black oxide on their fractured surfaces. Cold cracks, while they may be open occasionally, are generally very fine, clean cut as with a knife, and unless the castings are carefully inspected may sometimes escape observation. Ringing the castings with a hammer will often reveal the presence of cold cracks which are almost invisible. It is with the former, or hot cracks, that the present article is intended to deal.

The two principal causes of hot cracks are obstructions to the free contraction of the metal, and unsuitable composition of the metal itself. First then look into the causes which may prevent the unrestricted contraction of the metal. They are chiefly the rigidity of the mould and the varying thicknesses of section of the casting. The mould has to be made sufficiently strong to stand the weight of the steel and the fluid pressure of the head of metal while it is being poured. Moulds for steel castings are generally made in dried sand, which consists of silica sand mixed with a certain proportion of clay to bind it together. And though it is very weak in its green or damp condition, it becomes quite hard and firm after baking. The moulds are faced with a wash made of silica flour and molasses water, which gives a very hard, refractory skin. It is therefore important that while the mould should be strong enough to stand all the pressure it is to receive, it should not be any stronger than is necessary for the above purpose. Means may be provided for making the mould stronger in some parts than others, for instance near the gate, where the cutting action is greatest. At these places the mould may be made of a stronger grade of sand, or if its shape allows, hard cores or firebricks cut to shape may be fitted in, to take the wear of the stream of metal. All square corners, both inside and outside, should be amply filleted, and wherever a rib or a projecting arm of the pattern protrudes, the sand in its immediate vicinity should be loosened up by ramming in cinders, sharp sand or sawdust; or the mould can be cut away to within two or three inches of the pattern, after it has been dried, and the space filled in with burnt sand.

Another point to be attended to with the idea of reducing the danger of hot cracks is the drying of the moulds. To produce the best results a mould should be rather over-dried than under-dried, that is to say it should be almost but not quite burned. A mould that is only just dry is in the most rigid possible condition; it can be baked a good deal more and yet preserve sufficient strength to stand the wear and tear of pouring, and it will then offer much less resistance to the shrinkage of the metal. The ideal mould, as has been said before, consists of a hard refractory skin and a collapsible backing, which will give way as soon as the cooling skin of the casting has become sufficiently rigid to support itself, and begins to shrink. It is to the production of these conditions as nearly as may be possible in practice that foundrymen have to bend their efforts.

Defective construction of cores is another fruitful source of cracked castings. Coremaking is a branch of the steel foundry trade that does not receive the attention it merits. It is equally as important, as the mould itself, calls for as much skill and contributes equally to the success or failure. And yet we often find the coremaking relegated to a very secondary place. Core sand mixtures should be as carefully studied as molding sand mixtures, and a great saving may be effected, not only in the matter of cracking, but in the cost of cleaning and the soundness of the castings by careful attention to this point. The same description applies to a core as to a mold—it should have a hard, smooth face, which will resist the cutting and fusing action of the metal, but it should crumble and fall out in the form of powder when burnt. Careful handling will permit the use of cores which seemingly are exceedingly delicate. As the writer has previously stated, cores can be made of almost anything, provided the wash is all right. When the core is rammed up it should have a good coat of

a wash made of silica flour, ceylon graphite and molasses water, and then put in the oven and baked until after scratching the skin the inside is thoroughly "rotten." Then another coat of wash or two if necessary may be given, and the core is redried. It is surprising how strong this skin becomes, and it is no more than one thirty-second of an inch thick.

In a great many cases a core has to stand much greater pressure than the mold itself, as for instance in a pipe or cylinder, where the metal is shrinking on the core from every direction. If the core is not collapsible one of two things must happen—either it will crack the casting or the core will become so hard that its removal will be a very expensive and lengthy operation.

The second point, namely, the composition of the metal itself, is equally important with the foregoing. Any conditions which tend to hot shortness of the metal, which means brittleness above red heat, must be carefully avoided. The two principal elements found in common practice which have this tendency are sulphur and copper, and while their influence is not very great in the cold state of the steel, still, as the metal has to pass through the hot short period before cooling to the ordinary temperatures, it is important they should be kept as low as possible. Either of them by itself is dangerous, but the combination of the two is fatal. As a large proportion of Eastern iron is made from ores from the Cornwall district, a great deal of the scrap available, as well as the iron, has an appreciable content of copper, and it is therefore necessary to watch the sulphur most carefully, and care should be taken not to allow it to run over .045 percent. This is done by selecting melting stock as low as possible and running a high manganese, which will prevent increase of sulphur from the coke, etc., and tend to reduce it, if anything, by the formation of sulphide of manganese.

ASSOCIATIONS AND SOCIETIES.

Philadelphia Foundry Foremen.

W. P. Cunningham, Secretary, Pencoyd, Pa.

The Philadelphia Foundry Foremen at their June meeting had a report from the delegates that attended the National meeting in New York. It was also voted to omit the summer meetings, the next regular meeting being held in September.

Milwaukee Foundry Foremen.

Sol. Shaw, care Clinton Street Foundry of Allis-Chalmers Co., Secretary.

The regular meeting of the Milwaukee Foundry Foremen was held July 6. Officers for the ensuing year were elected as follows: Wm. Beck, of the Brand Stove Co., president; Chas. Thielges, of the Greenslade Foundry Co., vice president; Sol. Shaw, of the Allis-Chalmers Co., secretary; Peter Hott, of the Filer & Stowell Co., was re-elected treasurer.

After the election of officers there was some discussion in regard to changes in the constitution. The principal discussion was upon the subject of whether the meetings should be held once or twice a month, and it was finally decided to continue holding the meetings once a month, the first Monday of each month being selected as meeting night. Three new members were taken in.

Chicago Foundry Foremen.

Mr. Thompson, Link Belt Co., District Vice President.

The Chicago Foundry Foremen held their regular meeting on Friday evening, June 23. There was a general discussion on the "Use of Thermit in the Foundry" and there was also a paper presented on "By-Product Coke" by Mr. Schwerin, of Milwaukee. It was decided to change the meeting night from Friday to Saturday, so that hereafter the regular meetings will be held on the third Saturday evening of each month at 8 o'clock at the Grand Pacific hotel.

NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.

Fred F. Stockwell, Secretary, care of the Barbour-Stockwell Co., Cambridgeport, Mass.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.

F. H. Zimmers, Secretary, care Union Foundry and Machine Co.

PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.

Howard Evans, Secretary, care J. W. Paxson Co.

ASSOCIATED FOUNDRY FOREMEN.

Frank C. Everitt, Secretary, 2113 Third Ave., New York, N. Y., care the J. L. Mott Iron Works.

Note: All communications for the society should be addressed to the secretary.

President, David Reid, Canadian Westinghouse Co., Hamilton, Canada; first vice president, W. H. Nicholls, Berkshire Mfg.

Co., Cleveland, O.; second vice president, Hugh McPhee, Eaton, Cole & Burnham Co., Bridgeport, Conn.

Vice presidents are as follows: For Erie Association, W. F. Grunau, Erie City Iron Works, Erie, Pa.; for Milwaukee Association, William Beck, of the Brand Stove Co., Milwaukee, Wis.; for Chicago Association, Mr. Thomson, Link Belt Co., Chicago, Ill.; for Indianapolis Association, W. S. Keller, of Hetherington & Berner Co., Indianapolis, Ind.; for New York Association, C. H. Thomas, New York City; for Cleveland Association, A. L. Hott, Interstate Foundry Co., Cleveland, O.; for Philadelphia Association, A. T. William, Enterprise Mfg. Co., Philadelphia, Pa.; for Hamilton, Canada, Association, Frank Reid, D. Moore & Co., Hamilton, Canada.

NEW YORK FOUNDRY FOREMEN'S ASSOCIATION.
C. H. Thomas.

ERIE FOUNDRY FOREMEN.
W. F. Grunau, Dist. Vice Pres., care Erie City Iron Works.

HAMILTON, ONT., FOUNDRY FOREMEN'S ASSOCIATION.
A. Chase, care Sawyer & Massey Co., Secretary and Treasurer.

CLEVELAND FOUNDRY FOREMEN.
W. H. Nicholls, 608 Gordon Avenue, District Vice-President.

INDIANAPOLIS FOUNDRY FOREMEN.
W. S. Keller, of Hetherington & Berner Co., District Vice President.

CINCINNATI FOUNDRY FOREMEN.
E. W. Cadwell, Secretary.

PERSONALS.

Mr. E. E. Linthicum, manager of the United States Cast Iron Pipe & Foundry Co., Anniston, Ala., has tendered his resignation, to take effect as soon as his successor is appointed. Mr. Linthicum has been manager of this large plant for five years, and much of its success is due to his close personal attention. He has resigned in order to accept the management of a new company which is now being formed, and which is to establish a large plant of the same nature somewhere in the south.

Mr. C. E. Mills, of the C. E. Mills Oil Co., Syracuse, N. Y., has been seriously ill with appendicitis and peritonitis at his residence in Syracuse. At the last report Mr. Mills was getting along well and the doctors looked for his speedy recovery. Mr. Mills was at the convention of the American Foundrymen's Association in New York City, and had the pleasure of making many new acquaintances among the foremen and proprietors, and all of his friends will certainly wish him a speedy recovery.

Patrick McManus, who has been superintendent of the Sterling Steel Foundry Co.'s plant at Braddock, Pa., for the last two years, has resigned to accept a position as manager of the Sharon Steel Foundry Co., at Wheatland, Pa.

Louis Knapp has resigned his position as manager of The Stiles Foundry & Supply Co., of Parkersburg, W. Va., and has accepted a position with Tuttle & Baily, of Brooklyn, N. Y.

Richard Carrick has recently accepted the position as foundry foreman for Donkin & Co., Walker-Gate, New Castle-on-Tyne, England.

Mr. Chas. C. Woods, who has been secretary of the Wheeling Mold & Foundry Co., Wheeling, W. Va., for the past three years, has resigned his position with that company to become secretary of the West Virginia Bridge & Construction Co., of Glennova, W. Va.

Arthur Simonson, superintendent of the foundries of William Wharton Jr. & Co., of Philadelphia, will sail for Europe on August 12.

Mr. W. H. Nicholls, who has been connected with the Hill Clutch Co., of Cleveland, for several years, looking after its foundry work and the ordering of castings which were obtained from outside foundries, has resigned his position and accepted a position with the Berkshire Mfg. Co., of Cleveland, O., where he will act as salesman and demonstrator for its machines.

Mr. R. T. Crane, of the R. T. Crane Co., the main offices of which are in Chicago, entertained the managers of the various branches, together with the officers of the R. T. Crane Co., at his summer home at Lake Geneva, Wis. The celebration was in commemoration of the fiftieth anniversary of Mr. Crane's connection with the business. Everything that could be done to add to the comfort and pleasure of the guests was arranged

for, including yacht rides on the lake and various forms of entertainment. At the same time arrangements were made for a grand excursion for the employes connected with the various works in Chicago.

Frederick T. Towne, general superintendent of the Yale & Towne Mfg. Co., Stamford, Conn., is seriously ill in that city. He was operated upon July 1, for appendicitis, this being the second operation. The physicians believe Mr. Towne will recover.

W. A. Jones, of the W. A. Jones Foundry & Machine Co., Chicago, will make a summer trip to Alaska.

Frederick W. Sivyer, president of the Northwestern Malleable Iron Co., Milwaukee, has returned from a three months' trip to Europe.

Horace W. Fernald, formerly with the Tonawanda Iron & Steel Co., and later with the Buffalo office of Rogers, Brown & Co., has been appointed resident manager at Boston of Rogers, Brown & Co. W. G. Moody retires as Boston manager on account of ill health.

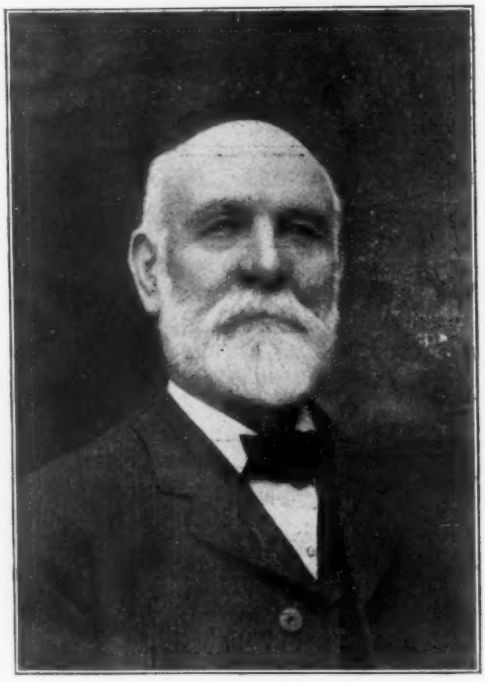
DEATHS.

Alva Carpenter, president of A. Carpenter & Sons Foundry Co., was born in Seekonk, Mass., March 2, 1829. He was the son of Capt. Jonathan and Lepha (Bourne) Carpenter and a lineal descendant of William Carpenter, who was the original proprietor of Rehoboth and the first town clerk, 1643-1649, of the township. The first American ancestor came from London, England, in 1638 in the ship Bevis.

Alva Carpenter attended the common schools of his town until fifteen years of age and then spent two years in a cotton mill. At the age of seventeen, he was apprenticed to learn the molder's trade with Thomas J. Hill (now the Providence Machine Co.) and was later many years with the Corliss Steam Engine Co. in the foundry. In 1865 he started into the business as proprietor in company with Amos D. Smith, under the firm name of Smith & Carpenter, on Dyer street between Peck and Orange streets.

After eight years of partnership, Mr. Carpenter became the sole proprietor of the Aborn street foundry which he continued until 1883 when he took in as partner Henry C. Bowen under the firm name of Carpenter & Bowen. This partnership was dissolved in 1889 and Mr. Carpenter then associated with him his sons, Wm. H. and Henry A. and started the more extensive works on West Exchange street, known as A. Carpenter & Sons Foundry Co., which was incorporated in 1896 with Alva Carpenter as president.

An honorable business career extending over a period of 40 years, beginning in a very small way, has continued to increase and stands as a fitting tribute to the quiet, unpretentious industry, energy and ability manifested by Mr. Carpenter and his sons. Mr. Carpenter's genial temperament, his unassuming, sincere and cordial manners have



ALVA CARPENTER.

won him hosts of friends and he has few, if any, enemies.

Never seeking political office or preferment, he was, somewhat against his own wishes, twice elected as representative from Providence in the Rhode Island Legislature, but declined positively further nomination. He was always interested in good government and was for years a member of the Municipal League of Providence.

He was in later years much interested in the Pomham Club, of which he was a member and on Friday, the day he was stricken, he had dined there very pleasantly with his wife and daughter. The West Side Club al-

so had its attractions for him and he would quite regularly be seen there on Saturday evenings with a few genial friends.

He has for more than thirty years been active in Odd Fellowship and has occupied positions of trust and importance in that order. He was a charter member of Mount Pleasant Lodge.

He has been, since its organization, deeply interested in St. Andrews Episcopal Church, which he served many years as treasurer and as vestryman. Year by year, since its organization he has been a member of the Convocation of Providence elected by St. Andrews Church.

It was in his home life that his virtues shone brightest as husband, father and friend. In 1854 he married Mary Elizabeth Allen and the joyous celebration of their golden wedding a little more than a year ago was a fitting occasion crowning a half century of domestic happiness. Mrs. Carpenter, two married sons, Rev. Alva E. Carpenter and Henry A. Carpenter, the well known treasurer, vice president and general manager of the A. Carpenter & Sons Foundry Co., and their families, Mrs. Charlotte H. Carpenter, widow of William H. Carpenter and their daughter and Mrs. William A. O'Brien and Miss Mabel L. Carpenter survive him.

His children appreciate the fine traits of his noble, manly example. His kind affectionateness, his hospitality and love of home were well understood by all who were his favored guests and their name is legion.

Chas. Schenck, who was formerly manager of the Hertenstein foundry, at Columbus, O., died at his home in Columbus on June 22. He was 47 years of age and had had a very active career. For twelve years he conducted a foundry of his own in Columbus. He then retired from business for two years and later accepted a position as manager of the Hertenstein foundry, which he held at the time of his death.

Mr. J. H. Woody, who was for many years a leading business man of Asheville, N. C., and who was president of the Asheville Supply & Foundry Co., died on July 3. Mr. Woody was one of the best known men in the town and will be missed by many old friends and associates.

Mr. J. H. Gibson, secretary of the American Foundry & Machinery Co., of Chicago, Ill., was fatally injured in the wreck of the Twentieth Century Limited train on the Lake Shore road at Mentor, O., on June 21. He was taken to Cleveland, where he died at four o'clock on the morning of June 22.

FIRES.

The plant of the Austin Foundry Co., of Minneapolis, Minn., was damaged to the extent of $500 by fire, on July 10.

The foundry and two adjacent buildings of the Scranton Steam Pump Co., Scranton, Pa., burned on July 12, with a loss of $150,000, partially covered by insurance.

The foundry of Brown & Patterson, of Brooklyn, N. Y., was partially destroyed by fire on July 13.

The foundry of the East Jordan Foundry & Machine Co., of East Jordan, Mich., was damaged by fire on the night of July 5. Fortunately the fire was confined to the molding room, the pattern loft with its accumulation of patterns being saved.

The foundry and some other portions of the plant of the W. P. Brown Mfg. Co., of Racine, Wis., were destroyed by fire on June 16. The loss is estimated at $15,000, with $4,000 insurance. Mr. Brown states that while the loss is a very heavy one, he will rebuild at once.

The plant of the Dayton Malleable Iron Co., Dayton, O., was visited by fire on June 20. The fire originated in the core-making department and involved beside that part of the works their supply sheds and a small portion of the foundry, and part of the pattern department. The fire, however, was not so serious as to inconvenience them greatly for any length of time.

The new foundry and machine shop of Goins & Shank, Roanoke, Va., was completely demolished by the high wind which accompanied an electrical storm on June 20.

The foundry of the Dilts Machine Works, of Fulton, N. Y., was damaged by fire on the morning of June 20. The fire was of unknown origin. The night force did not leave the building until midnight and saw no signs of fire at the time they left. The property is said to be fully insured.

Owing to a misunderstanding of a telephone call, the fire department did not succeed in reaching the plant of the Elwood Iron Works, Kokomo, Ind., on June 27, and as a consequence, their buildings, valued at $3,000, were destroyed by fire. The loss is offset by $1,200 insurance.

The New Bedford Iron Foundry, of New Bedford, Mass., was damaged to the extent of $1,000 by fire on June 29.

NEW CONSTRUCTIONS.

The new foundry being built for the Brooks Locomotive Works, at Dunkirk, N. Y., is progressing rapidly.

The new building for the Newbury foundry, of Goshen, N. Y., is practically completed.

The car wheel foundry of the American Car & Foundry Co., of Berwick, Pa., is to be enlarged so as to give it a capacity of 540 freight car wheels per day.

The Ohio Cultivator Co., of Bellevue, O., is planning to build an addition to its plant 80 x 250 ft., which will give it one of the largest and most complete foundries of the kind in the country.

The Ensign Foundry Co., of Auburndale, near Toledo, O., is figuring on two new foundry additions. One will be 60 x 127 ft. and the other 40 x 87 ft.

R. H. Kiddle, of Kinsman, O., is improving his plant by adding a foundry for making iron and brass castings.

Plans and specifications have been prepared for the rebuilding of the plant of the Ohio Brass Works, of Mansfield, O., which was destroyed by fire some time ago. Four new buildings are to be constructed.

Architect J. T. Fortin has prepared plans for a foundry and pattern shop to be built at Canalport avenue and Johnson street, Chicago, Ill., for the Reder Foundry Co. The foundry will be one-story and 90 x 91½ ft. The pattern shop will be three stories and 76 x 103 ft. It is estimated that the two buildings will cost $40,000.

The Capitol Foundry, Springfield, Ill., owned by Joseph Farris, is to have an addition built. Plans are now in preparation for a building 120 x 120 ft., to be used as a machine shop. The shop will be equipped with a traveling crane and fullest switching facilities. The improvements will cost some $5,000.

Malpass Bros., of East Jordan, Mich., proprietors of the East Jordan Iron Works, whose foundry was destroyed by fire recently, have already gotten their new building well under way and propose to have the plant in operation some time during August. The new buildings are 26 x 70 and 26 x 57 ft. respectively.

A. M. Sweder, of the Lakeside Iron Works, Marquette, Mich., is planning a number of improvements in his foundry and machine shop. The foundry department has been idle for several months, on account of the fact that the building needed extensive repairs, including the rebuilding of a portion of it.

The Geo. A. Ohl Co. has started work on the construction of its new foundry at Newark, N. J., which is to be 56 x 235 ft.

Plans are being prepared for a plant consisting of machine shop, foundry, pattern and pattern storage shop, and boiler house, to be erected at Elkins, W. Va., for the Humphrey Mfg. Co., Towanda, Pa., which has lately been incorporated under the laws of West Virginia, with a capital stock of $25,000.

The United States Cast Iron Pipe Co. intends to move its Bridgeport plant to Chattanooga, Tenn., and have it running next spring.

The King Stove Works, successors to the Lizzie Lowman Stove Foundry Co., of Sheffield, Ala., has purchased ground adjoining its plant to enlarge the foundry and double its present capacity.

The Canadian Westinghouse Co. have prepared plans for doubling the size of their foundry building at Hamilton, Ont.

Ground has been broken for the additions to the foundry building of the Stanley Co.'s plant at Morningside, Pittsfield, Mass. The two additions, each 200 x 300 ft., will be of heavy mill construction.

Sargent & Co., hardware manufacturers, New Haven, Conn., have planned large extensions to their works, including a building, 50 x 600 ft., five stories high. The foundations for one section of the structure, 237 ft. long, are now being put in.

Messrs. Hartling & Moeckel, of Easthampton, Mass., have decided to build another addition to their plant, 50 x 80 ft., and several smaller additions to be used for offices, store room, pattern shop, etc. They conduct a general foundry business.

Innes-Demarest Stove & Heater Co., has closed a contract with the Carrington-Ford Co., Binghamton, N. Y., for the erection of the manufacturing section of its new plant. The foundry and machine shops will consist of three buildings connected and will be of brick and mill construction.

H. Delinsky will build a one-story brick foundry, 60 x 100 ft., at the corner of Moni-

tor street and Norman avenue, Brooklyn, N. Y.

The Hays Mfg. Co., Erie, Pa., reports that its new buildings will consist of a machine shop, 50 x 160 ft., two stories high; and running parallel with it a foundry building, 60 x 198 ft. The company expects to have these buildings ready for occupancy by Nov. 1. This company is particularly interested in the best and improved equipments for brass foundries and power equipments, and would like to receive catalogues covering those lines.

The Wm. Cramp & Sons Ship & Engine Building Co., of Philadelphia, Pa., has obtained a permit for building a brass foundry 55 x 134 ft., and several other buildings.

The Landis Tool Co., of Waynesburg, Pa., is putting up a new foundry 28 x 60 ft.

F. E. Myers & Bro., Ashland, O., manufacturers of paving tools, pumps, etc., have recently acquired land adjoining their present three-story machine shop on which they contemplate building a new addition 60 x 300 ft. A 75 x 200 ft. foundry addition made necessary by the growth of their trade is also being built.

A new building for the Troy Foundry Co., of Troy, O., is under construction. It will be 100 x 120 ft.

C. & A. Patts & Co., of Indianapolis, Ind., have let a contract for rebuilding their foundry and replacing the machinery.

The Morden Frog & Crossing Works have secured fifteen acres of land at Chicago Heights, Ill., and will begin the construction of a large plant which will ultimately give employment to about 500 workmen. The buildings planned at present are a main factory building 250 x 700 ft., together with smaller buildings to be used for power house, pattern shop and offices.

The Economical Stove Co., Jacksonville, Ill., will make additions and improvements in its plant, and has purchased a brass and iron foundry. Just what machinery will be needed has not been determined as yet.

The Chicago Hardware Foundry Co., Chicago, Ill., will rebuild its North Chicago plant which was recently destroyed by fire.

Henry Orme's Sons, of St. Paul, Minn., have purchased a five-acre tract in Columbia Heights and will build a plant there for the manufacture of brass and iron castings. They hope to have the plant in operation by September 1.

The Detroit Iron Castings Co. has obtained a permit for the building of a two-story brick storage vault, at a cost of $7,500.

L. C. Bonning, of Hartford, Mich., has his new foundry nearly ready for operation.

Mr. Edro Richardson, proprietor of the brass foundry at 318 North Holliday street, Baltimore, Md., has had plans prepared for an addition 23 x 85 ft., and has submitted the plans for estimates.

Mr. D. T. Sutherland, of Bainbridge, Ga., has begun work on his new iron foundry in West Bainbridge.

Mr. C. W. Fouche, owner of the Anniston Stove Foundry, Anniston, Ala., has secured the services of Mr. W. B. Graham, of Ashland, Ky., to look after the work at his stove foundry. He also states that he has secured patterns for a new line of ranges.

The Wellsburg Mold & Foundry Co., of Wellsburg, W. Va., has just completed another addition to its plant, made necessary by the company's engaging in the manufacture of a new heater.

The Campbell Furnace Co., of Des Moines, Ia., has let a contract for its new foundry at Twelfth and Mulberry streets to the Miracle Pressed Brick Co., for $4,400.

The Stout-Parke Foundry & Machine Co., of Carthage, Mo., has erected a new foundry building 40 x 50 ft.

The addition to the Grand Forks Foundry, Grand Forks, N. D., is nearly completed.

The equipment for the foundry of the Fisher Machine Works, at Leavenworth, Kan., is being installed.

The C. R. Harper Mfg. Co., of Marshalltown, Ia., is building a new foundry 40 x 80 ft. which is to be devoted to the manufacture of soil pipe.

Montreal Steel Works, Ltd., Montreal, Can., is spending about $200,000 for enlarging and improving its plant, chiefly on extensions to the molding and finishing department of its steel casting plant. Considerable new labor saving machinery of the best type will be installed.

The Toronto Furnace & Crematory Co., of Toronto, Can., will erect a foundry and machine shop.

GENERAL INDUSTRIAL.

The Hedford Foundry Co., of Waterloo, Ia., is building an addition to its foundry.

The Abner Doble Co., of San Francisco, Cal., announce that arrangements have been made with the John McDougall Caledonian Iron Works Co., Ltd., of Montreal, Canada,

whereby the latter becomes the sole licensee for the manufacture of the Doble system of water wheels in the Dominion of Canada.

The Marshalltown Aluminum & Brass Foundry Co., of Marshalltown, Ia., has been incorporated with a capital of $5,000. The incorporators are: Chas. Glick, I. T. Forbes, P. M. Bentley, E. L. Williams and P. Wishart. Mr. Forbes will be manager of the new concern.

The Safety Lock & Knob Co., Cazenovia, N. Y., has been incorporated with $100,000, capital stock to manufacture locks, door knobs and hardware. The incorporators are: Battese Revoir, Bartis M. Revoir, Eugene B. Goodrich all of Syracuse, N. Y.; Myrta E. Howell, Onondaga, N. Y.; Emmet H. House, Fulton, N. Y.

J. A. Fay & Egan Co., manufacturer of woodworking machinery, of Cincinnati, O., is increasing its capacity by erecting a 5-story building which will give the company 50,000 square feet of floor space. This will be used largely for a store house and exhibition room for their tools.

The Elyria Foundry Co., of Elyria, O., has been incorporated with a capital of $25,000.

The Standard Pattern Co., of Richmond, Ind., has lately been organized and now has its machinery installed and is doing considerable work for local manufacturing plants. They are prepared to make patterns of all kinds and also to make models or do other work in connection with the manufacture of new devices.

The stockholders of the Oregon Foundry & Machine Co., of Oregon, Ill., have voted to increase their capital stock $20,000 for the purpose of enlarging their plant.

The Kellogg Harvester Co., of Plano, Ill., took off the first heat in its foundry on June 9.

The Milwaukee Coke & Gas Co., has appointed Pickands, Brown & Co. exclusive selling agents for its Milwaukee Solvay foundry coke in Chicago and immediate vicinity.

The P. F. Wells Foundry at Milford, Mich., has been leased to Wilson & Hayes.

The Renfroe Replacer Co., of Birmingham, Ala., which was recently incorporated, expects in the near future to erect a foundry 80 x 300 ft. for making steel castings. The officers of the company are John Sweet, president; J. L. Renfroe, vice president; J. A. W. Smith, secretary and treasurer, and E. J. McCrossin, general manager.

John McKinney reports that he has completed his plant—the Woodburn Foundry & Machine Shop, at Woodburn, Ore., and has everything in working shape. The machine shop is 40 x 40 ft.; the pattern shop 40 x 40 ft. and the foundry 40 x 60 ft. with a cupola built on one side. There are also buildings for the cleaning department, core room, power plant, blacksmith shop, etc.

In the June number of The Foundry we had a notice stating that the Eaton, Cole & Burnham Co., of Bridgeport, Conn., had been absorbed by the Crane Bros. Co., of Chicago, Ill. Since then we have received a notice from the Eaton, Cole & Burnham Co. stating that the report was not true, and that the two companies were entirely separate, the only foundation for such a story being that one member of the Crane family was financially interested in both plants.

The Whitcomb Mfg. Co., P. Blaisdell & Co., and the Whitcomb Foundry Co., all of Worcester, Mass., have been merged into one corporation, and will hereafter be known as the Whitcomb-Blaisdell Machine Tool Co., the capital stock being $200,000. The officers are Alonzo W. Whitcomb, president; Chas. E. Hildreth, vice president and treasurer; Samuel H. Clary, clerk.

The Stamford Foundry Co., Stamford, Conn., manufacturer of stoves, ranges and furnaces expects to add largely to its plant to meet the needs of its growing business resulting in its close affiliation with the Stamford Gas Stove Co. Some new machinery will be installed, orders for part of which have been placed.

The Lidgerwood Mfg. Co., Brooklyn, N. Y., making boilers, hoisting engines, etc., will remove to Newark, N. J., where a plant, estimated at a cost of $2,000,000, will be erected.

The W. P. Taylor Co., of Buffalo, N. Y., has been incorporated with a capital of $150,000 and will conduct a general iron foundry business. The directors are Wm. Perry Taylor, Frank J., Abel and Grace Taylor, all of Buffalo.

The Stoever Foundry & Mfg. Co., Myerstown, Pa., reports its plant crowded with work in both foundry and machine departments.

G. C. Blackmore has practically closed his negotiations for the land, buildings and stock of the Penn Radiator Co., of Corry, Pa., and hopes to have the plant in operation by September 1.

The Riverside Foundry & Machine Works, Pittson, Pa., J. A. Touhill, proprietor, is now purchasing machinery for equipping the shops which it has acquired at Scranton, Pa.

E. E. Hughes, receiver for the Franklin Roiling Mill & Foundry Co., of Franklin, Pa., has entered into contract with the Chicago Pneumatic Tool Co., whereby the former will manufacture all the gray iron castings used by the latter company, whose foundry has been closed on account of labor troubles.

The Bond Foundry & Machine Co., has been organized as successors to the business of Chas. Bond, manufacturer of power transmitting machinery and supplies, at present located at 518 Arch street, Philadelphia, Pa. A change of location is contemplated and the plant of the Grear-Clarkson machine shops has been purchased as a new site. The property acquired consists of a main shop, smith shop, boiler house and pattern shop, together with a number of smaller buildings. Some additional machinery equipment it is expected will be needed for new installation. The officers of the company are: Chas. Brown, president; Joseph Burr, vice president; Henry M. Beamsderfer, treasurer and H. H. Schenck, secretary. These officers and F. M. Shaw and Philip F. Ruhl constitute the board of directors.

The Dresden Machine Co., Dresden, O., has been incorporated with a capital stock of $10,000. The new company intends to conduct a general machine repair shop and also a modern foundry. The F. M. Walker machine shop conducted in Dresden, has been taken over by the new company It is located along the tracks of the Wheeling & Lake Erie railroad, and is considered a valuable piece of property. Immediate repairs will be made in the plant. The incorporators are: C. S. Littick, Emile A. Schenk, Henry A. Walker, E. J. Littick and R. Schenk. Emeil A. Schenk has been chosen president, and C. S. Littick, secretary and treasurer. Mr. E. A. Schenk was formerly master mechanic in the Dresden sheet mill. He is a practical and skilled machinist and will direct the mechanical developments. A number of new mechanics will be employed in addition to those who have been working for the *old* Walker Machine Co., and a much larger number of castings are expected to be produced from the foundry.

The Atlantic Foundry Co., of Akron, O., has been incorporated with a capital of $10,000. The incorporation is merely to reorganize the company and increase its capital. The incorporators are Chas. Reyman, Fred Spaulding. Philip Wittenbacher, Emil Krill and Ewald Erikson.

The Norwalk Iron & Brass Foundry Co., of Norwalk, O., has been incorporated with a capital of $10,000. The incorporators are John M. Book Jr., Aaron Townhill, Andrew B. Hamilton, Joe Herrimann and Chas. Books.

The Wm. G. Fischer Stove & Range Co., Cincinnati, O., has been incorporated with a capital of $20,000. The new company will take over the interests of Wm. G. Fischer and others.

The Mersfelder Pattern Co., of Cincinnati, O., has been incorporated with a capital of $10,000. The incorporators are M. L. Mersfelder, Daniel, Harry G., Clifford L., and Chas. H. Mersfelder.

The American Foundry & Machine Co., of Lindenwald, O., has been incorporated with a capital of $25,000. The incorporators are Abraham Ballinger, Adam Winchleman, Fred Dulli, Casper Schow, W. E. Schow, and John E. Foutz.

The City Brass Foundry Co., of Cleveland, O., has been incorporated with a capital of $10,000. The incorporators are Wm. D. Hirsch, Geo. Hammink, Frank J. Borsch, Gus Hirsch and Chas. Zucker.

Mr. F. W. Burger, a draughtsman in the employ of the Fort Wayne Foundry & Machine Co., Fort Wayne, Ind., has invented a new gas producer, one of which has been installed in the works of the Fort Wayne Foundry & Machine Co., to furnish gas for the 50 h. p. engine in this plant. The inventor claims that by the use of this gas producer he will be able to greatly reduce the cost of fuel necessary to furnish power.

Crane Co., of Chicago, Ill., announces that about June 24, the general offices and sales departments will move to the new office building at 519 S. Canal street, near the Judd street plant. The old location at 10 N. Jefferson street has been used by the company since 1864, and a branch of the city sales department will be continued at the old address.

The Chicago Pneumatic Tool Co., announces that the company has purchased the Canadian Pneumatic Co., of Montreal, and has secured that company's entire capital stock and will take possession within the next 30 days. This purchase gives the Chicago Pneumatic Tool Co. a Canadian plant which will enable it to transact business in

Canada at a large saving of cost in the way of tariff duties, etc.

The Independent Pneumatic Tool Co., of Chicago, Ill., has acquired the Aurora Automatic Machinery Co., of Aurora, Ill., builders of the Thor piston air drills, pneumatic riveting, chipping, calking and heading hammers and other pneumatic appliances.

The Moline Plow Co., of Moline, Ill., will put its foundry in operation at once. The plant has been idle for two years, during which period the castings have been secured from outside parties.

The work of remodeling the plant of the Summit Foundry Co., La Crosse, Wis., is progressing rapidly and the plant will be in operation before long.

The Roe-Stephens Mfg. Co., of Detroit, Mich., has purchased from C. W. Thomas the Michigan Brass & Iron Works, of Detroit, Mich. No change will be made in the management, as C. W. Thomas remains as president of the Roe-Stephens Mfg. Co.

The Union Steam Pump Co., of Battle Creek, Mich., is installing a brass foundry, equipped with the latest appliances, in connection with its iron foundry.

Dempsey & Sons, Shipbuilders, of Camden, N. J., are having several new buildings erected in connection with their plant, to be used as work shops and pattern department.

At the annual meeting of the United States Cast Iron Pipe Co., held at Burlington, N. J., June 28, the retiring board of directors was re-elected with the exception that L. R. Lemoyne was elected in place of F. Callahan.

The firm of Stewart & Bruckner, Nashville, Tenn., celebrated its thirtieth anniversary on June 22. It is a remarkable fact that both of the original members of the firm are still in active business along the same lines that they chose when they first started. For twenty-five years the plant has been located on its present site. Mr. Stewart has always looked after the shop and foundry, while Mr. Bruckner has had charge of the office and financial affairs.

The Central City Foundry & Machine Co., of Central City, Ky., has been in active operation for over two months and is building up a good trade.

The taking off of the first casting at the plant of the Coosa Pipe & Foundry Co., Gadsden, Ala., has been delayed on account of the fact that the elevators and some other machinery have been slow in arriving.

The works and main office of the Frictionless Metal Co., formerly of Richmond, Va., are now located in the company's own building at Chattanooga, Tenn. The new plant has a capacity of 4,000 lb. of frictionless metal per day.

The Chattanooga Roofing & Foundry Co., Chattanoogo, Tenn., of which J. E. Annis is president, has purchased the grate business from the Cahill Iron Works, and this business will be transferred to the Chattanooga plant. In order to accommodate the new business, which includes the patterns, foundry equipment, etc., of the Cahill works. Mr. Annis will erect a large addition to his present plant.

The Bruce Pattern & Mfg. Co. has been incorporated with a capital of $4,000. The company will commence business in Birmingham, Ala. The officers are: A. C. Bruce, president; W. T. Archer, secretary and treasurer, and J. W. Bruce, general manager.

J. R. Jones, manager of the Huntsville Foundry & Machine Works, Chattanooga, has completed arrangements for handsome improvements to be made at his local plant.

The South Pittsburg Foundry Co., of South Pittsburg, Tenn., has secured its charter from Virginia and filed a copy of it with the secretary of state.

The Southern Brass Works, of Atlanta, Ga., have started their new plant.

The technical schools connected with the Washington State University at Seattle, Wash., will have extensive additions made to their equipment, including woodworking, blacksmith shop, and foundry additions.

The Leggett Pump Co. has secured the plant of the old Parrot Stove Co., at Carthage, Mo., and will put it in operation at once.

The Ashdown Hardware Co., Little Rock, Ark., has been incorporated with $50,000, capital stock. The incorporators are: H. L. Toland, president; N. C. McCrory, vice president; C. L. Briant, secretary and treasurer.

The Fargo Iron & Foundry Co., Fargo, N. D., recently incorporated to take over the Parson Kellman Iron Works, Litchfield, Minn., and the T. L. Sykes Boiler Machine Works, Fargo, N. D., will erect a new plant in the latter place.

The new plant of the Mexican Car & Foundry Co., at Hutchison, Mexico, is completed, the machinery has been tested, and work started on the construction of cars.

Jack Marsden and John Schulz, both of Bessemer, Colo., have bought a foundry at Canon City, Colo., which they expect to put in operation at once.

Index to Volume XXVI.

March 1905 to August 1905.

Accounting, Core Room Records..... 78
Air Compressor, A New..... 32
" Fresh 115
Alloys, Lead in 39
Alloying, Practical 276
Aluminum as a Pattern Metal 186
" in Iron 38
" Melting Scrap 19
American Foundrymen's Association Convention in New York City 161
American Foundrymen's Association, Convention of 114
American Foundrymen's Association, Members Attending 221
American Foundrymen's Association, Pictures of Officers 262
American Foundrymen's Asociation, President's Address at 202
American Foundrymen's Association, Secretary's Report at 203
American Steel Foundries, Removal of..... 142
American Tool Making and Interchangeable Manufacturing 239
Analysis of Brass and Bronze, Practical Methods for 5
Analysis, Purchasing Pig Iron by..... 244
Artisans, Summer School for..... 142
Associated Foundry Foremen, Business Meeting of 197
Associated Foundry Foremen, Constitution of.. 198
" " " Report of Secretary of 208
Associations and Societies.....33-90-125-182-240-296
Automobile Cylinders, Air Cooled..... 61
" " Castings for 138
" " Mixtures for 86
Bars, Test 112
Bells, ... 15
Benches for Patternmakers 111
Binders, Core Sand 56
Blackings, Foundry 4
Blacksmith & Wheelwright, Souvenir Number of 21
Blow Holes in Castings 38
" or Drawing 86
Blowers, Piping and Cupolas at the plant of the Michigan Stove Co 206-232
Books, New 43-63-141-239-261
Brass Castings, Cores for..... 179
" Foundry Notes 39-87-139-179-244-294
" Foundry of Yale & Towne Mfg. Co..... 103
" Melting Equipment of the National Transit Co. 259
Brass Mixtures 40
" Molds, Casting in 142
" Practical Methods of Analysis of..... 5
Bronze, Manganese 87
" Manganese 116
" Phosphor 244
" Pinions, Mixture for 294
" Practical Methods of Analysis of..... 5
Brushes, Revolving 143
Buoyancy of Cast Iron 292
By-Product Coke, Making of 66
Car Wheel Casting Difficulties.....12-88
" " Manufacture, Continuous Process for 92
Carbon and Silicon..... 86
Carnegie Research Scholarship 177
Cast Iron, Buoyancy of 292
" " Comparison of Standard Methods of Testing 263
" " Economic Value of 89
" " Hard 268
" " Melting of with Steel 248
" " Microstructure of 137
" " Modes of Testing..... 89
" " Notes 38-86-138-178-244-292
Casting Difficulty, A.....29-63
Casting Difficulties, Car Wheel.....12-88
" in Brass Molds 142
" Iron on Steel..... 96
" Mending a, with Thermit..... 95
" Round Flasks in Cores..... 14
Castings, Blow Holes in..... 38
" Centrifugal 88
" Close Iron for 138
" for Automobile Cylinders 138
" Hot Cracks in Steel..... 294
" Producing Sound 30-171
" Spongy Spots in Thin 292
Cement for Sidewalk Glass..... 294
Centrifugal Castings 88
Chemistry in Foundry Practice..... 63
Chicago Pneumatic Tool Co., New Air Compressor of 32
Coke, Making of By-Product..... 66
" Manufacture of By-Product..... 63
" Melting Ratios, Retort 207-229
Complaint, A (Poem) 61
Constitution of the Associated Foundry Foremen 198
Continuous Process for Car Wheel Manufacture 92
Core for a Large Drum 275
" Machine, A British 108
" Ovens Using Oil as Fuel..... 16
" Room Records 78
" Sand Binders 56
" Sands 281
Cores, A Modern Method of Venting..... 235
" Casting Round Flasks in..... 14
" for Brass Castings 179
Corliss Engine Cylinders, Mixtures for..... 86
Costs, Foundry 157
" Production 207
Credit Man and His Work, The..... 43
Cupola, A Whiskey Bottle..... 41
" Lining a 159
" Mixture, to Figure a..... 38
" To Increase the Capacity of..... 178
" Tuyere, Watt 266
Cupolas, Blowers and Piping at the Plant of the Michigan Stove Co. 232
Cylinders, Air Cooled Automobile..... 61
" Automobile, Mixtures for..... 86
" Castings for Automobile 138
" Mixtures for Corliss Engine..... 86
" Cylinders, Spongy Spots on..... 86
Deaths 46-143-192-251-298

Index to Volume XXVI.—Continued.

Diamond Clamp & Flask Co.'s Exhibit at the A. F. A. 220
Drum, Making a Spiral in Loam 22
" Sweeping a Cylindrical and Conical..... 270
Education of Foundrymen..... 10
Electric Hoist, A New Traveling..... 84
Elements of General Drafting..... 240
Employes, Welfare Work for..... 240
Engineers' Turning 261
Falls Rivet & Machine Co., Exhibit of at A. F. A. 220
Fires 47-97-144-192-251-299
Flask Pin, A Patent..... 9
Flasks, Casting Round in Cores..... 14
Fluor Spar 140
Foaming Slag 21-84
Foundry and Pattern Shop Standards..... 214
" Blackings 4
" Brass, of Yale & Towne Mfg. Co..... 103
" Costs 157
" Department of the Imperial Works of the Oil Well Supply Co. 151
" Department of the National Transit Co. 257
" Experience, A 7
" Iron, of the Yale & Towne Mfg. Co.... 53
" Molding in a Stove..... 86
" of Jeanesville Iron Works 1
" Practice, Chemistry in 63
" Science in the 136
" Trade Schools, Report of Committee on 205
" Work, Metallography Applied to..... 105
" Metallography Applied to..... 156
Foundries, Overhead Traction for..... 9
Foundryman, Trouble with the..... 85
" Trouble with the..... 191
Foundrymen, Education of 10
Fragility, Test for 125
Fremont Method of Determining Fragility of Iron and Steel 125
Furnace Practice, Some Melting 83
Gearing, A Treatise on Tooth..... 43
Grate Bar Difficulty, A..... 43
Hard Cast Iron 268
High Temperature Measurements 63
Hoist, A New Traveling Electric..... 84
Horses for Patternmakers..... 111
Horseless Age, The, Special number of..... 267
Hot Cracks in Steel Castings..... 294
Industrial Notes, General.....48-99-147-194-254-301
Insurance, Pattern 204
Iron and Steel Institute, Meeting of the..... 186
" Buoyancy of Cast..... 292
" Comparison of Standard Methods of Testing Cast 263
" Determination of Silicon in Pig..... 217
" Economic Value of Cast..... 89
" Foundry of the Yale & Towne Mfg. Co... 53
" Fremont Method of Determining Fragility in 125
" Hard Cast 268
" High Silicon Pig 29
" Microstructure of Cast..... 137
" Modes of Testing Cast..... 89
" Purchasing of Pig by Analysis..... 244
" Shot 42-65-109-177-294
Irons, Making of Sad 244
Jeanesville Iron Works, Foundry of..... 1
Kick, An Old Man's 20
Labor Saving in Stove Manufacture..... 166
Lead in Alloys 39
Lifting Magnets 83
Lining a Cupola 159
Loam, Making a Spiral Drum in 22
Loam Work, Sweeping a Cylindrical and Conical Drum 270
Magnets, Lifting 83
Make Your Plant a Success 169
Malleable Cast Iron Notes.....39-87-140-179-293
" Casting Mixtures 180
" Castings, Memoranda on German..... 31
" Department of the Oil Well Supply Co. 154
" Iron, Influence of Silicon, Manganese, Carbon, Sulphur and Phosphorus in Producing Temper Carbon in..... 31
Manganese Bronze 87-116
Mechanical Drawing 239
Melting Furnace Practice, Some..... 83
" Ratios, Retort Coke 207-229
" Scrap Aluminum 19
" Steel with Cast Iron..... 248
Metal, Aluminum as a Pattern..... 186
" for Casting Ornaments..... 294
" Mixers for Foundry Use..... 206
" Refining, Ancient and Modern..... 276
Metallography Applied to Foundry Work....105-156
Metallurgical Report 217
Microstructure of Cast Iron 137
Mixture, Figuring a Cupola 38
Mixtures, Malleable 293
Mold Drying Method for Steel Castings..... 37
Molds, Casting in Brass..... 142
" for Making Repairs with Thermit..... 61
Molder, Making a 207-245
Molding in a Stove Foundry..... 86
" Machine Patent, A..... 290
" " Practice 172
" Machines, Demonstration of 34
" Materials 30
" Sand 12
National Transit Co., Foundry Department of.. 257
New Construction 47-98-144-192-252-300
Oil as Fuel for Core Ovens..... 16
" Well Supply Co., Foundry Department of.... 151
Organizing a Factory 261
Pangborn Co., Thos. W., Exhibit at the A. F. A. 219
Pattern Insurance 204
" Metal, Aluminum as a 186
" Shop System 118
Patterns, Skeleton 162
Patternmakers' Benches and Horses..... 111
Personals 46-97-143-192-251-297
Phosphor Bronze 244
Pig Iron, Determination of Silicon in..... 217
" " High Silicon 29
" " Purchasing by Analysis 244
" " Warrant System, American 208
Pin, A Patent Flask 9
Piston Ring, A Large 141
Plaster of Paris, Use of in the Foundry..... 249
President's Address at American Foundrymen's Association 202

Index to Volume XXVI.—Continued.

Publications, Trade.....44-97-143-191-236-266
Records, Core Room 78
Retort Coke Melting Ratios 229
Revolving Brushes 143
Ruthless Rhymes (Poem) 267
Sad Irons, Making of 244
Sand Binders, Core 56
Sands, Core 281
Sash Weights, Making of 109
" " Manufacture of 245
Schools, Report of Committee on Foundry Trade. 205
Science in the Foundry..... 136
Secretary's Report at American Foundrymen's Association 203
Semi-Steel 138
Shot Iron 42-65-109-177-294
Silicon and Carbon 86
" Determination of in Pig Iron..... 217
" in Malleable Castings 180
Skeleton Patterns 162
Slag, Foaming 21-84
" Recovery of Brass from..... 139
Smoke Prevention and Fuel Economy 141
Societies and Associations.....33-90-125-182-240-296
Sound Castings, Producing of..... 171
Spiral Drum, Making of in Loam..... 22
Standards, Foundry and Pattern Shop..... 214
Steel, Casting Iron on..... 96
" Castings, Hot Cracks in..... 294
" " Mold Drying Method for..... 37
" Fremont Method of Determining Fragility in 125
" Melting Equipment of the National Transit Co. 258
" Melting of with Cast Iron 248
Steel, Semi 138
Steele-Harvey Melting Furnace, Some Practice with 83
Stove Foundry, Molding in a 86
" Manufacture, Labor Saving in..... 166
Strength of a one-inch test Bar..... 178
Sulphur, Trouble with 38
Sweeping a Cylindrical and Conical Drum..... 270
" a Spiral Drum 22
System, Pattern Shop 118
Tapping Hole for Reservoir 87
Test Bars 112
" for Fragility 125
Testing Cast Iron, Comparison of Standard Methods of 263
" Cast Iron, Modes of 89
Thermit, Mending a Casting with 95
" Molds for Making Repairs with..... 61
" Use of 289
" Use of in a Railroad Shop..... 226
Tools for Engineers and Woodworkers..... 239
Trade Outlook 10-62-114-160-238-268
Trade Publications 44-97-143-191-236
Trade Schools, Winona Technical Institute..... 115
Trolley Track System for Foundries..... 9
Trouble with the Foundryman 191
Tuyere, Watt Cupola 266
Venting Cores, A Modern Method of..... 235
Watt Cupola Tuyere 266
Wax, Use of for Venting Cores..... 235
Weights, Making of Sash 109
Welfare Work for Employes 240
Winona Technical Institute Trade Schools..... 115
Yale & Towne Mfg. Co., Brass Foundry of..... 103
" " " " Iron Foundry of..... 53

Authors' Index to Volume XXVI.

Barnes, S. E.—Automatic Core Ovens Using Oil as Fuel 16
Beeks, Gertrude—Welfare Work in Shops..... 240
Beers, John J.—Air-Cooled Automobile Cylinders 61
Bowman, Ralph—Foundry Costs 157
Boyle, Jas.—Shot Iron 42
Buchanan, J. F.—Practical Alloying 276
Cecil, O. B.—A Casting Difficulty 63
Corse, W. M.—Practical Methods of Analysis for Brasses and Bronzes 5
Cunningham, R. P.—Melting Steel with Cast Iron 248
Des Anges, H. L.—The Use of Thermit..... 289
Dunning, B. J.—Test Bars..... 112
Elliott, Matthew—Foaming Slag 84
Gilmour, Edw. B.—The Use of Plaster of Paris in the Foundry 249
Hall, F. W.—Molding Machine Practice 172
Handley, Edw.—Foaming Slag 84
Hills, R. C.—Fluor Spar 140
Horner, Joseph—Making a Spiral Drum in Loam 22
Karow, H.—Revolving Brushes..... 143
Keep, W. J.—Blowers, Piping and Cupolas at the Plant of the Michigan Stove Co..... 232
Keep, W. J.—Cast Iron Notes...38-86-138-178-244-292
Kirk, Dr. Edward—Make Your Plant a Success.. 169
Lane, H. M.—Making a Molder 245
Leary, Wm.—Casting Iron on Steel..... 96
Longmuir, Percy—Manganese Bronze 116
MacDowell, R. W.—Core Room Records..... 78
Magee, John—Labor Saving in Stove Manufacture 166
Malone, Harry—Making Sash Weights..... 109
" " —Manufacture of Sash Weights.. 245
" " —Melting Scrap Aluminum 19
McCaslin, H. J.—Casting Round Flasks in Cores 14
" " —Skeleton Patterns 162
" " —Sweeping a Cylindrical and Conical Drum 270
Moldenke, Dr. Richard—A Comparison of Standard Methods for Testing Cast Iron 263
Moldenke, Dr. R.—Malleable Cast Iron Notes.... 39-87-140-179-292
Monroe, John S.—Patternmakers' Benches and Horses 111
Moore, Edwin A.—Making of By-Product Coke.. 66
Morehouse, W. S.—Shot Iron 177
Murphy, Jas. A.—A Modern Method of Venting Cores 235
" " —A Whiskey Bottle Cupola.... 41
Olsen, Thorsten Y.—The Fremont Method of Determining the Fragility of Iron and Steel.... 125
Perrigo, Oscar E., M. E.—Pattern Shop System 118
Perrott & Sons, Ltd., Richard—Shot Iron..... 109
Ramp, P. R.—Producing Sound Castings..... 171
Redington, Patrick—Mending a Casting with Thermit 95
Renkin, S. M.—Large Piston Ring..... 141
Ricketts, John—Lining a Cupola..... 159
Robeson, J. S.—Core Sand Binders..... 56
" " —Core Sands 281
Sauveur, Albert—Metallography Applied to Foundry Work 105-156
Schwerein, C. M.—Notes on Some Retort Coke Melting Ratios 229
Shattuck, W. S.—Trouble with the Foundryman.. 191
Shed, N. W.—Chemistry in Foundry Practice.... 63
" " —Foundry Blackings 4
Simonson, Arthur—Hot Cracks in Steel Castings 294
Souther, Henry—Hard Cast Iron..... 268
Tuttle, H. N.—Aluminum as a Pattern Metal... 186
Vickers, C.—A Foundry Experience..... 7
" " —Brass Foundry Notes 39-87-139-179-244-294
Warne, J. C.—Car Wheel Casting Difficulties.... 88
Webb, Jas. F.—The Use of Thermit in a Railroad Shop 226
Wooden, P. M.—Casting Difficulty, A..... 29
" " Shot Iron 65-177-294
Zelde—A British Core Machine..... 108
Zimmerman, W. S.—A Complaint (Poem) 61
" " Ruthless Rhymes (Poem) 267

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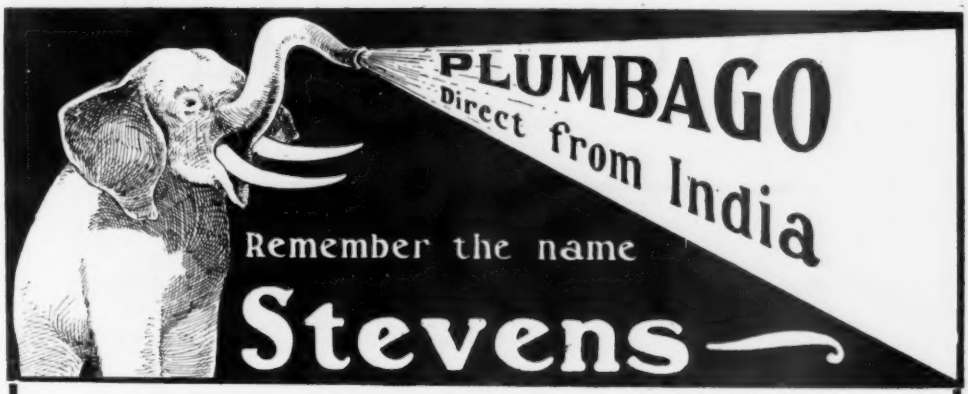
Alphabetical Index to Advertisers.

Adams Co....11, 71
Addy, Matthew, & Co....96
Ajax Metal Co....82
American Air Compressor Works....95
American Blower Co....27
Atlas Car & Mfg. Co....81
Balkwill Pattern Works....88
Barbour-Stockwell Co....80
Barnard & Leas Mfg. Co....86
Barnett, Oscar, Foundry Co....26
Bartlett, N. S., & Co....96
Battle Creek Interior Finish Co....79
Berkshire Mfg. Co....16
Blackwell, Geo. G., Sons & Co....88
Blake, Geo. F., Mfg. Co....99
Brass Founders' Supply Co....90
Bristol Co....95
Brown Specialty Machinery Co....21
Buckeye Milling Co....36
Buffalo Foundry Supply Co....8
Burdick & Son....92
*Byram & Co....—
Carborundum Co....85
Case Mfg. Co....89
Channon, H., Co....93
Cherry Valley Iron Co....35
Chicago Pneumatic Tool Co....87
Church, S. R....95
Clark Cast Steel Cement Co....25
Clark, D. N....23
Coburn Trolley Track Mfg. Co....39
Columbus Iron & Steel Co....96
Connersville Blower Co....100
Cornell, J. B. & J. M., Co....94
Curtis & Co. Mfg. Co....30
Dalton, Nash & Co....96
Dayton Pneumatic Tool Co....87
DeCamp Bros. & Yule Iron, Coal & Coke Co....96
Dempwolf, E. A., & Sons....94
Diamond Clamp & Flask Co....95
Dimmick, J. K., & Co....96
Dings Electro Magnetic Separator Co....77
Dixon, Joseph, Crucible Co....44
Dobson, William....94
Domhoff & Joyce Co....96
Elm City Engineering Co....89
Etting, Edward J....90
Falls Rivet & Machine Co....22
Fanner Mfg. Co....85
Field, Robt, Sales Agency....97
Gautier, J. H., & Co....46, 95
General Chemical Co....90
Genesee Metal Works....94
Gilmour, J....81
Gobeille Pattern Co....88
Goldschmidt Thermit Co....92
Goodrich, F. A., & Co....96
Gould & Eberhardt....91
Hanna Engineering Works....31
Hawley Down Draft Furnace Co....80
Herman, Chas., & Son....17
Hill & Griffith Co....6
Hillman, J. H., & Son....96
Holland Linseed Oil Co....14
Hooper, G. K....25
Hunt, C. W., Co....94
Ingersoll-Sergeant Drill Co....79
Jones & Attwood....91
Keep, W. J....83
Kendall & Flick....94
*Kent Mfg. Co....—
Kilbourne & Jacobs Mfg. Co....91
Laidlaw-Dunn-Gordon Co....99
Lindsay, W. W., & Co....47
Manning, Maxwell & Moore....74
Maris Bros....75
Maurer, Henry & Son....94
McCormick, J. S., Co....9
McCullough-Dalzell Crucible Co....45
McKeefrey & Co....96
Metallurgical Laboratory....95
Middleditch, Benjamin....78
Midvale Mining & Mfg. Co....95
Millett Core Oven Co....83
Mills, C. E., Oil Co....78
Mohr, J. J....96
Monarch Engineering & Mfg. Co....41
Mumford, E. H. Co....18
National Jeloluse Co....90
New Era Lustre Co....93
New Era Mfg. Co....92
Niles-Bement-Pond Co....74
Northern Engineering Works....75, 83, 89
Norwalk Iron Works Co....71
Obermayer, S., Co....2, 3
Oregon Foundry & Machine Co....15
Osborn Mfg. Co....92
Otis Steel Co....93
Partamol Co....73
Pawling & Harnischfeger....76
Paxson, J. W., Co....4, 5
Pedrick & Ayer....76
*Pettinos Bros....—
Phosphor Bronze Smelting Co....93
Pickands, Brown & Co....97
Pickands, Mather & Co....97
Piling & Crane....97
Piqua Flour Co....67
Pridmore, Henry E....10
Rand Drill Co....28
Republic Iron & Steel Co....34
Ricketts & Banks....95
Ridgway, Craig, & Son Co....32
Robeson Process Co....37
Rockwell Engineering Co....40
Roessler & Hasslacher Chemical Co....88
Rogers, Brown & Co....97, 98
Roots, P. H. & F. M., Co....19, 20
Sellers, Wm., & Co....42
Shanafelt Mfg. Co....87
Shepard, Chas. G....97
Shuster, F. B., Co....82
Smith, J. D., Foundry Supply Co....7
Smith & Caffrey Co....89
Smooth-On Mfg. Co....24
Standard Sand & Machine Co....84
Sterling Oil Co....95
Stevens, F. B....69, 97
Stow Mfg. Co....91
Sturtevant, B. F., Co....29
Superior Charcoal Iron Co....97
Sutch & Potter....84
Tabor Mfg. Co....12, 77
Taylor, Robert J., Inc....43
Taylor, Wilson & Co....13
Thomas Furnace Co....97
Tilghman-Brooksbank Sand Blast Co....86
Walter-Wallingford & Co....97
Walter, Wm. B., & Co....94
Whiting Foundry Equipment Co....48
Yale & Towne Co....84



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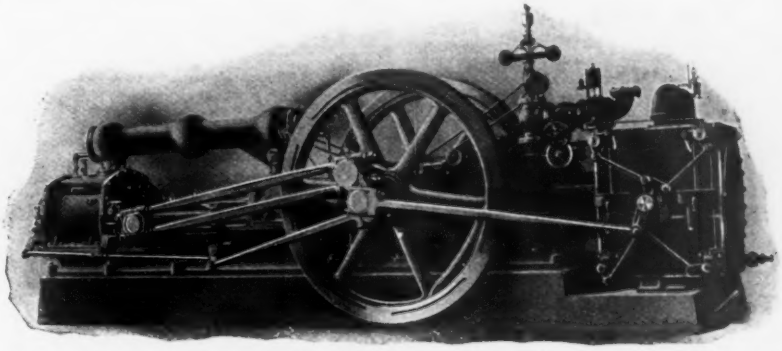

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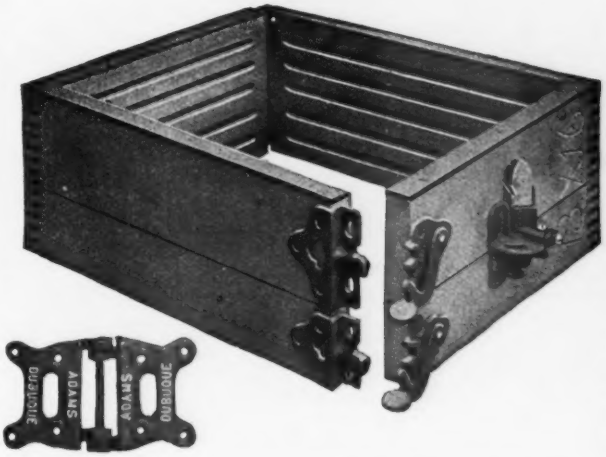

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All the property and assets of the Dayton Foundry Company, exclusive of the cash on hand and in bank, and including the office fixtures, foundry supplies, machinery and tools, one 75-horse-power Miller gas engine and appliances, wrought and cast scrap iron, bills and accounts receivable, are offered for sale.

Bids will be received for the sale of the same in whole or in part. For full information, schedule and list of property, call upon or address

HARRY FLUHART,
Trustee in Bankruptcy, Dayton, O.
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WANTED.—A man familiar with the molding of brass. Reference required. Box 459, THE FOUNDRY, Cleveland, O.

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WANTED.—At once, 50 stove plate moulders for our new foundry. No strike. Steady employment the year around for good men. Also one stove pattern moulder. Address, ABENDROTH BROTHERS, Port Chester, N. Y.

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WANTED.—An A-1 up-to-date foundry foreman to make machinery castings. None need apply except those familiar with stripping plate molding machines. DELOACH MILL MFG. CO., Atlanta, Ga.

WANTED.—An assistant foreman and instructor for grey iron foundry in large Eastern agricultural implement concern. State age, experience, references and salary expected. Box 460, THE FOUNDRY, Cleveland, O.

WANTED.—A Foundry Foreman who understands handling men and getting out work at the least possible cost, and who can invest $2000.00 or more in a good business. Box 468, THE FOUNDRY, Cleveland, Ohio.

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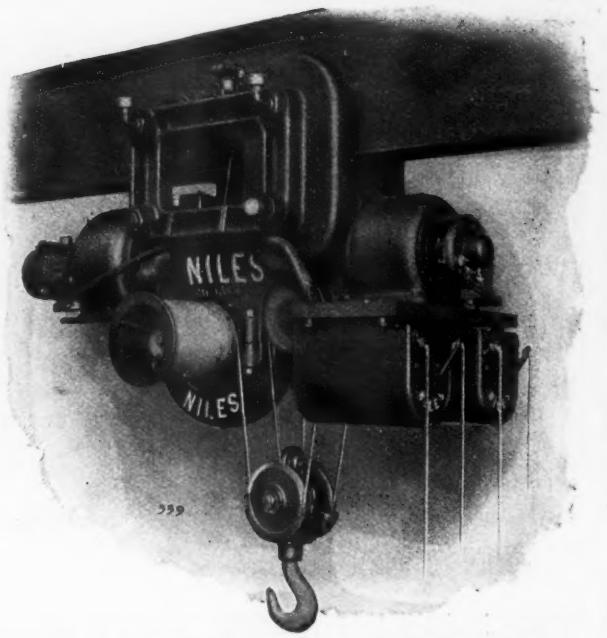

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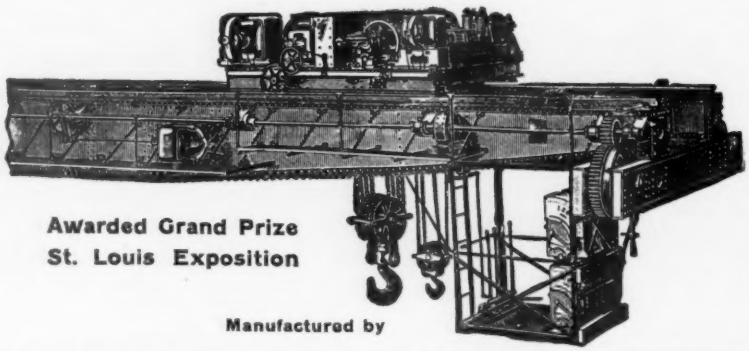

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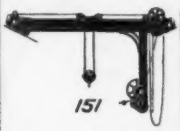

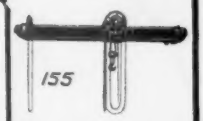

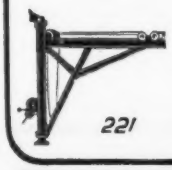

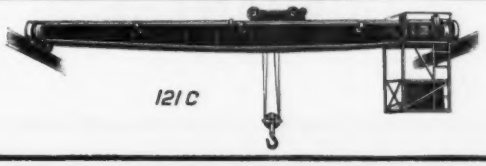

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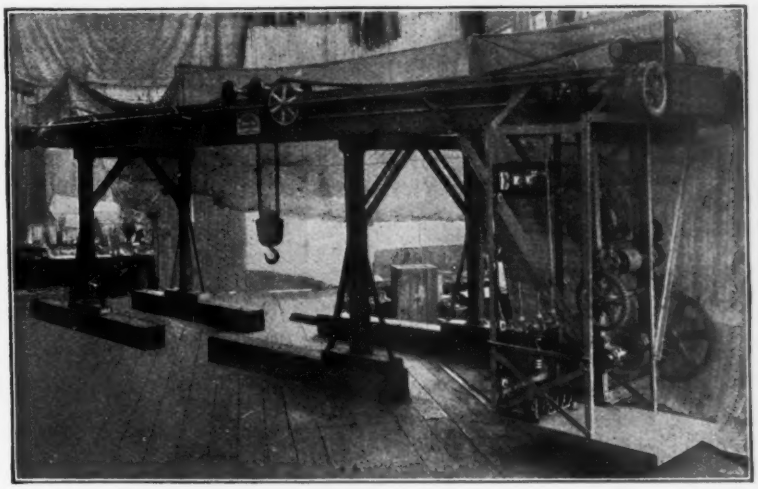

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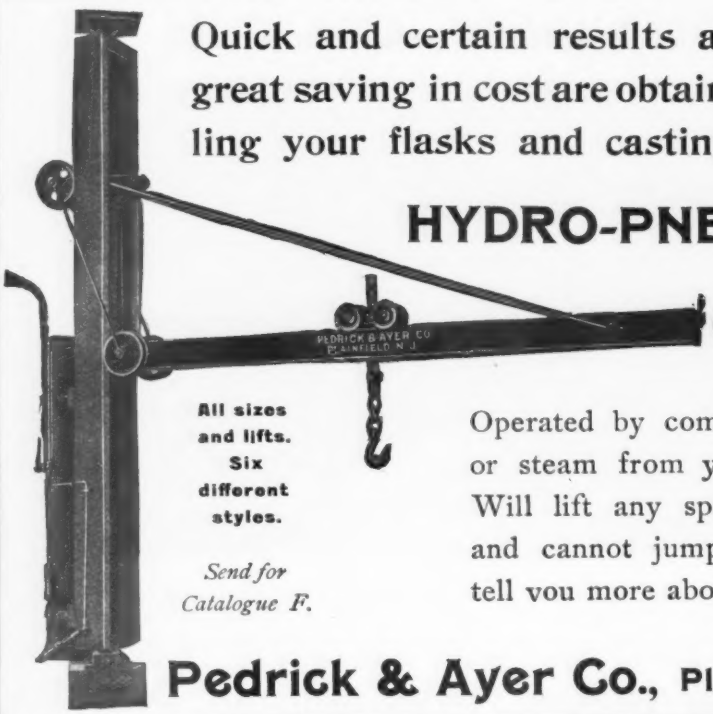

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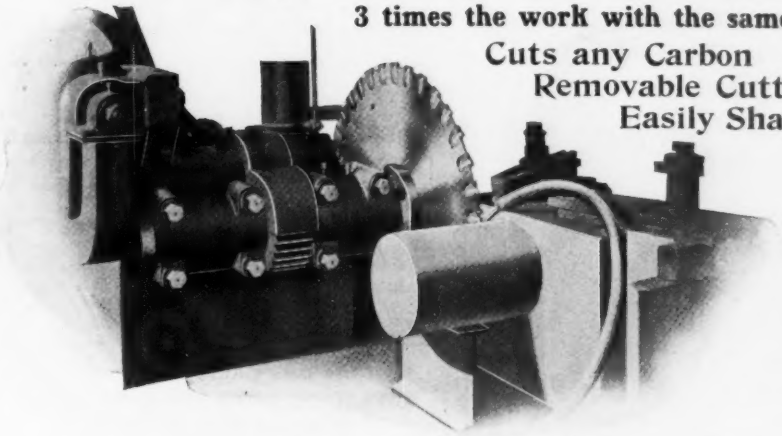

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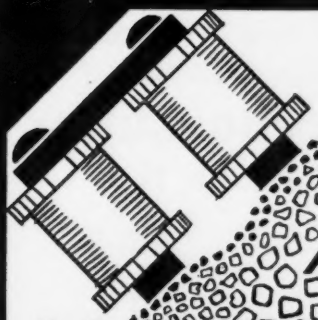

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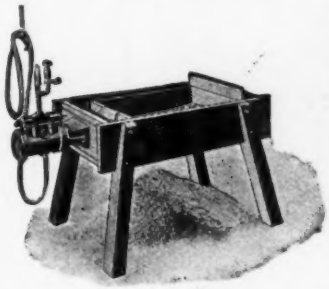

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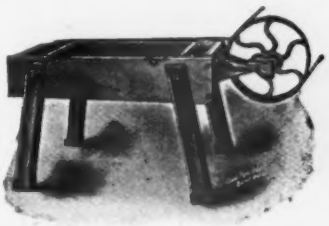

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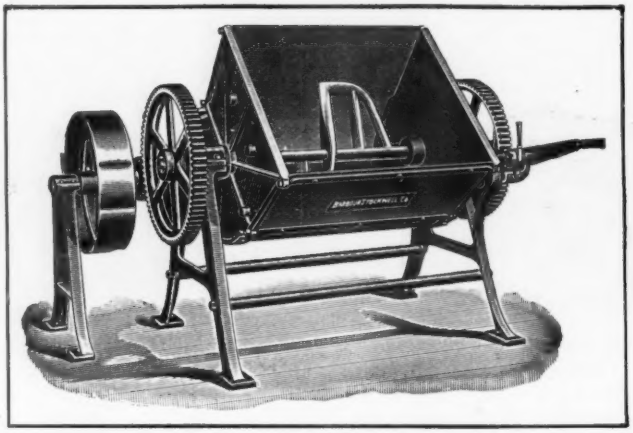

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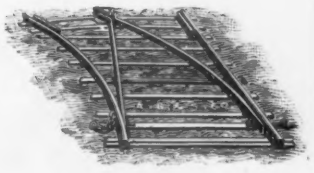

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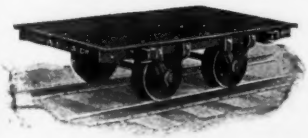

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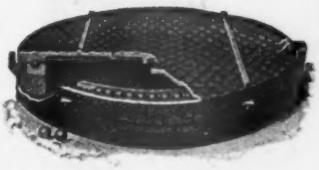

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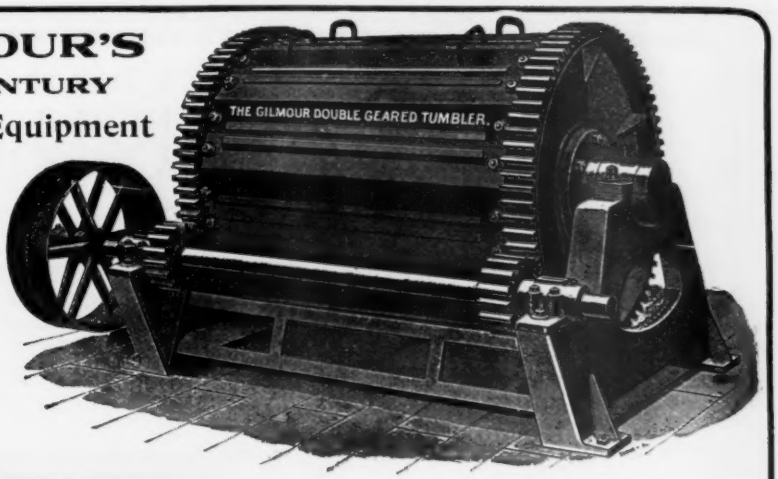

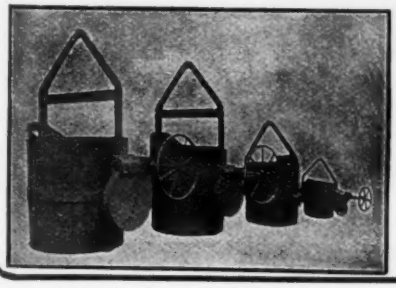

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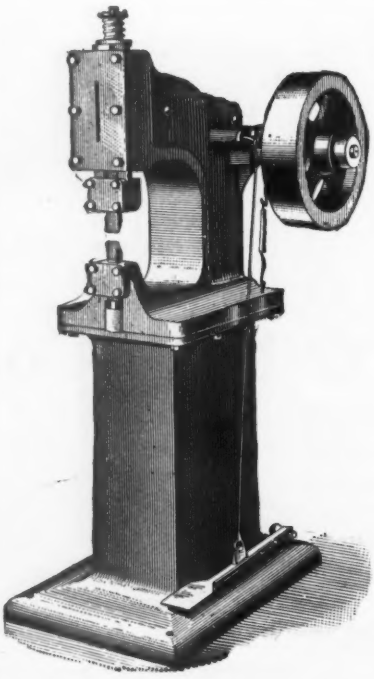

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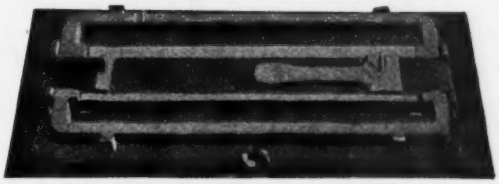

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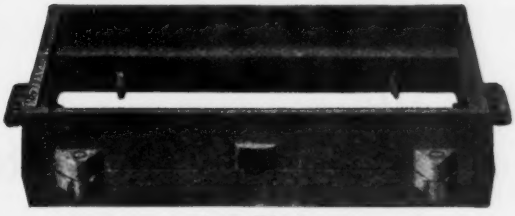

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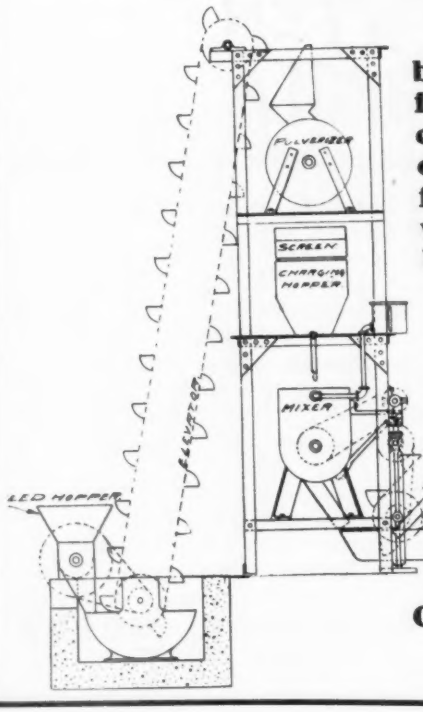

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Quality first-class and prompt shipment guaranteed. Catalogue and prices furnished on application.

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THE melting zone of the Cupola is a source of constant trouble and expense to foundrymen.

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Open joints and holes in brick work can be closed with Carborundum Mortar and the lining made as efficient as a new lining.

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A sample keg will be sent free to foundrymen.

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Agents for this material in Great Britain.

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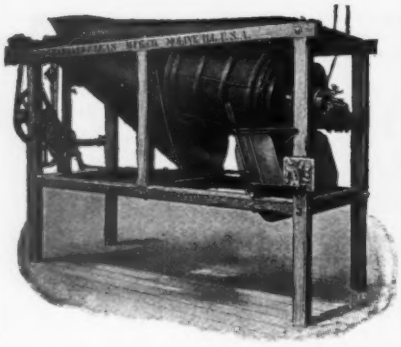

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¶ It will separate the iron from your foundry refuse, cupola drop and slag.

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¶ Give it a trial. If not satisfactory it will cost you nothing.

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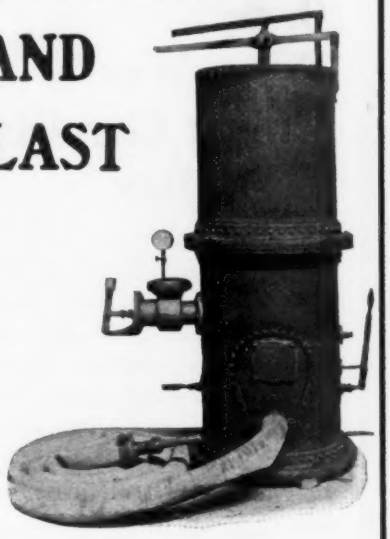

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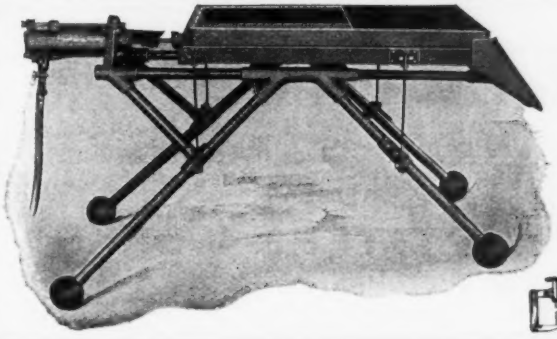

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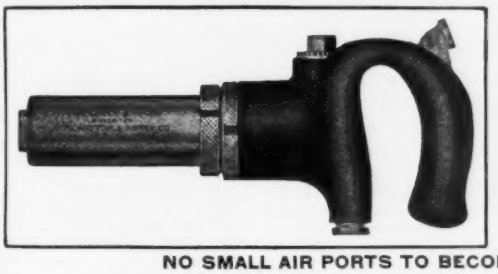

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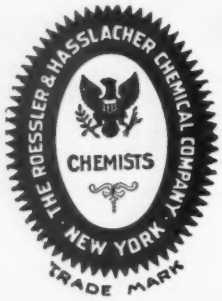

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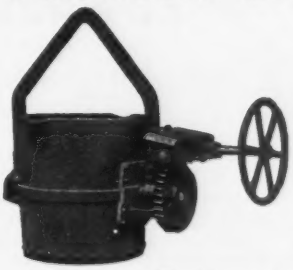

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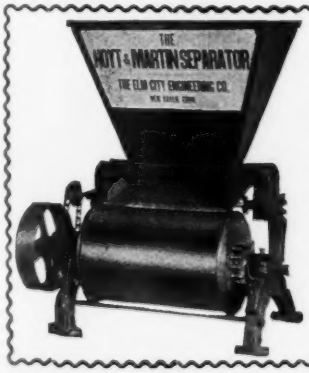

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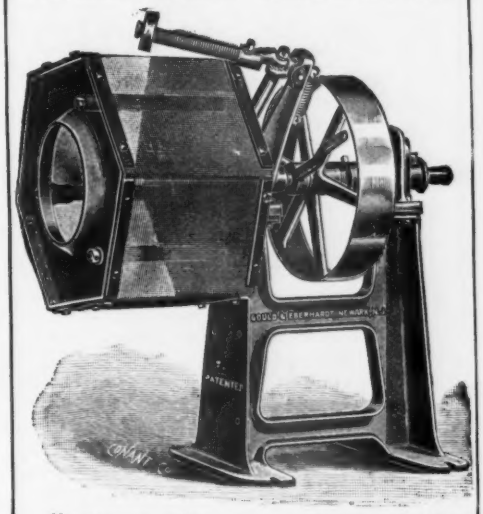

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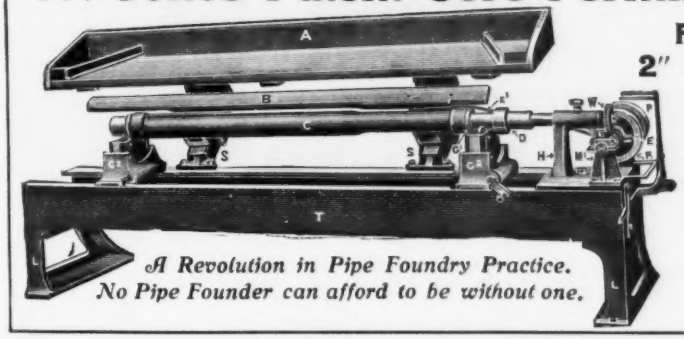

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PUNXY—Punxsutawney Iron Company, Punxsutawney, Pa. A strong Foundry iron, made from Lake Superior ores and local coke. Popular as a high grade machinery iron. Low in Sulphur. Produces castings which finish well under machine tools. Capacity 200 tons daily.

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(To be Continued)

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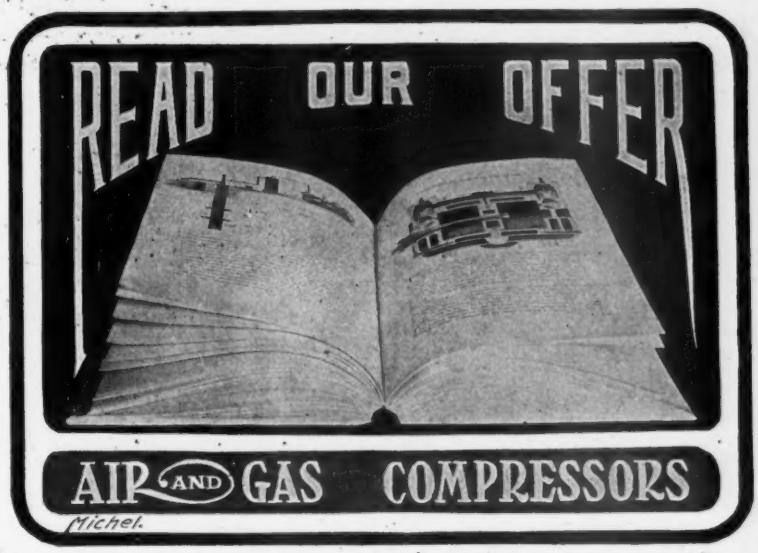

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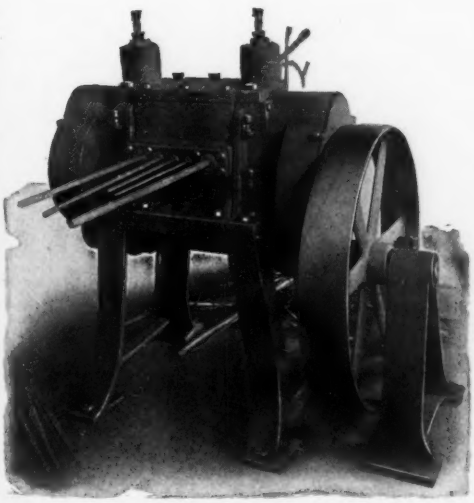

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